3.0 Site-Wide 2002 Operations Data

The Yearbook's role is to provide data that could be used to develop an impact analysis. However, in two cases, worker dose and dose from radioactive air emissions, the Yearbook specifically addresses impacts as well. In this chapter, the Yearbook summarizes operational data at the site-wide level. These impact assessments are routinely undertaken by LANL, using standard methodologies that duplicate those used in the SWEIS; hence, they have been included to provide the base for future trend analysis.

Chapter 3 compares actual operating data to projected effects for about half of the parameters discussed in the SWEIS, including effluent, workforce, regional, and long-term environmental effects. Some of the parameters used for comparison were derived from information contained in both the main text and appendices of the SWEIS. Many parameters cannot be compared because data are not routinely collected. In these cases, projections made by the SWEIS ROD (DOE 1999) resulted only from expenditure of considerable special effort, and such extra costs were avoided when preparing the Yearbook.

3.1 Air Emissions

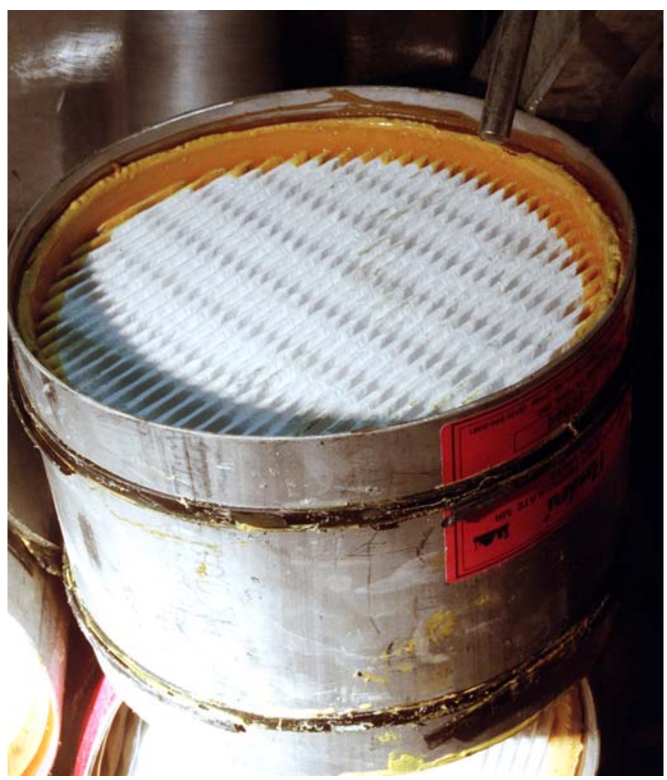
3.1.1 Radioactive Air Emissions

Radioactive airborne emissions from point sources (i.e., stacks) during 2002 totaled approximately 6,150 curies, 30 percent of the 10-year average of 21,700 curies projected by the ROD. These low emissions result from operations at the Key Facilities not being performed at projected levels and from the conservative nature of the emissions calculations performed for the SWEIS.

As in 1999, 2000, and 2001, the two largest contributors to radioactive air emissions were tritium from the Tritium Facilities (both Key and Non-Key) and activation products from LANSCE. Stack emissions from the Tritium Key Facilities were about 1,500 curies and from other facilities were about 360 curies. Tritium emissions from the Non-Key Facilities were dominated, as in 1999–2001, by cleanup activities at TA-33 and TA-41.

Emissions of activation products from LANSCE were increased over 2000 levels. The total point source emissions were approximately 4,300 curies. The Area A beam stop did not operate after 1998 and operations in Line D resulted in the majority of emissions.

Non-point sources of radioactive air emissions are present at LANSCE, Area G, TA-18, and other locations around the Laboratory. Non-point emissions, however, are generally small compared to stack emissions. For example, non-point air emissions from LANSCE were less than 150 curies. Additional detail about radioactive air emissions is provided in the Laboratory's annual compliance report to the EPA on June 30, 2003, and in the 2002 Environmental Surveillance Report (LANL, in preparation).



HEPA filter

Table 3.1.1-1 summarizes the radioactive air emissions data reported in the 1998–2002 Yearbooks.

Maximum offsite dose will continue to be relatively small for 2002. The final 2002 dose is estimated to be approximately 1.6 millirem, with the final dose being reported to the EPA by June 30, 2003.

Table 3.1.1-2 presents the dose estimates and the actual doses.

Table 3.1.1-1. Radioactive Air Emissions

EMISSION CATEGORY	SWEIS ROD	1998	1999	2000	2001	2002
Point Sources % of 10-year average	21,700 Ci/year 21,700 Ci/year	8,690 Ci <50	1,900 Ci <10	3,100 Ci 15	15,400 Ci 70	6,150 Ci 30
Select Stack Emissions: Tritium Key Facilities Non-Key Tritium Facilities	 2,000 Ci/year 910 Ci/year	 710 Ci [b]	 650 Ci 950 Ci	 1,200 Ci 1,150 Ci	 8,400 Ci [a] 1,000 Ci	 1,500 Ci 360 Ci
Point Source – LANSCE	16,800 Ci/year — estimated 10-year average	7,875 Ci	300 Ci	700 Ci	<6,000 Ci	<4,300 Ci
Non-point Source – LANSCE	---	<500 Ci	<20 Ci	<150 Ci	<160 Ci	<150 Ci

[a] This includes a puff release of 7,600 curies of tritium gas (HT or T2) that occurred in January 2001.
[b] Data for the Non-Key Tritium Facilities were not included in the 1998 Yearbook.

Table 3.1.1-2. Maximum Offsite Dose Estimates (millirem)

MAXIMUM OFFSITE DOSE	SWEIS ROD	1998	1999	2000	2001	2002
Estimate	5.44	1.72	0.32	0.65	1.9	1.6
Actual	---	1.72	0.32	0.65	1.84	1.69

Recording data at an AIRNET Station

3.1.2 Non-Radioactive Air Emissions

3.1.2.1 Emissions of Criteria Pollutants

Criteria pollutants include nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter. LANL, in comparison to industrial sources and power plants, is a relatively small source of these non-radioactive air pollutants. As such, the Laboratory is required to estimate emissions, rather than perform actual stack sampling. As Table 3.1.2.1-1 illustrates, all 2002 emissions of criteria pollutants are within the estimated emissions presented in the SWEIS ROD, with the exception of particulate matter. These increased emissions are attributable primarily to the operation of three air curtain destructors. These air curtain destructors are used to burn wood and slash from fire mitigation activities around the Laboratory. These operations emitted a total of 12.2 tons of particulate matter during 2002.

Table 3.1.2.1-1. Emissions of Criteria Pollutants

POLLUTANTS	UNITS	SWEIS ROD	1998 OPERATIONS	1999 OPERATIONS	2000 OPERATIONS	2001 OPERATIONS	2002 OPERATIONS
Carbon monoxide	Tons/ year	58	17.9	32	26	29.08	28.1
Nitrogen oxides	Tons/ year	201	68	88	80	93.8	64.7
Particulate matter	Tons/ year	11	3.0	4.5	3.8	5.5	15.5 [a]
Sulfur oxides	Tons/ year	0.98	0.29	0.55	4.0 [b]	0.82	1.3 [c]

[a] The increased emissions of particulate matter are primarily due to the operation of three air curtain destructors to burn wood and slash from fire mitigation activities around the Laboratory.

[b] The higher emissions of sulfur oxides (SO_x) are due to the main steam plant burning fuel oil during the Cerro Grande Fire.

[c] The increased emissions of SO_x are due to operation of the three air curtain destructors to burn wood and slash from fire mitigation activities around the Laboratory.

Approximately two-thirds of the most significant criteria pollutant, nitrogen oxides (NO_x), results from the TA-3 steam plant. In late 2000, LANL received a permit from the NMED to install flue gas recirculation equipment on the steam plant boilers to reduce emissions of NO_x. This equipment became operational in 2002, and initial source tests indicated a reduction in NO_x of approximately 70 percent.

SO_x emissions for 2002 result from the operation of three air curtain destructors to burn wood and slash from fire mitigation activities. Total emissions for 2002 from these units were one ton of SO_x.

Criteria pollutant emissions from LANL's fuel burning equipment are reported in the annual Emissions Inventory Report as required by the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20.2.73 NMAC). The report provides emission estimates for the steam plants, nonexempt boilers, the asphalt plant, and the water pump. The water pump which was a large source NO_X emissions, was transferred to Los Alamos County in November 2001. In addition, emissions from the paper shredder, rock crusher, degreasers, and permitted beryllium machining operations are reported. For more information, refer to LANL's 1999 and 2000 Emissions Inventory Report (LANL 2000a, 2001a).

3.1.2.2 Chemical Usage and Emissions

The 1999 edition of the Yearbook proposed to report chemical usage and calculated emissions for Key Facilities obtained from the Laboratory's Automated Chemical Inventory System. (Note: In 2002 the Laboratory transitioned to the new EX3 chemical inventory system and no longer uses the Automated Chemical Inventory System.) The quantities presented in this approach represent all chemicals procured or brought on site in the respective calendar year. This methodology is identical to that used by the Laboratory for reporting under Section 313 of the Emergency Planning Community Right-To-Know Act (42 USC) and for reporting regulated air pollutants estimated from research and development operations in the annual Emissions Inventory Report (LANL 2000a, 2001a).

Air emissions shown in Tables A-1 through A-14 of Appendix A are divided into emissions by Key Facility. Emission estimates (expressed as kilograms per year) were performed in the same manner as those reported in the 1999, 2000, and 2001 Yearbooks (LANL 2000b, 2001b, 2002a, respectively). First, usage of listed chemicals was summed by facility. It was then estimated that 35 percent of the chemical used was released to the atmosphere. Emission estimates for some metals, however, were based on an emission factor of less than one percent. This is appropriate because these metal emissions are assumed to result from cutting or melting activities. Fuels such as propane and acetylene were assumed to be completely combusted; therefore, no emissions are reported.

Information on total volatile organic compounds and hazardous air pollutants estimated from research and development operations is shown in Table 3.1.2.2-1. Projections by the SWEIS ROD for volatile organic compounds and hazardous air pollutants were expressed as concentrations rather than emissions; direct comparisons cannot be made, and, therefore, projections from the SWEIS ROD are not presented. The volatile organic compound emissions reported from research and development activities reflect quantities procured in each calendar year. The hazardous air pollutant emissions reported from research and development activities generally reflect quantities procured in each calendar year. In a few cases, however, procurement values and operational processes were further evaluated so that actual air emissions could be reported instead of procurement quantities. As for particulate matter emissions, operation of the air curtain destructors resulted in increases of volatile organic compounds and hazardous air pollutants emissions during 2002. The air curtain destructors accounted for 22.9 and 2.1 tons of volatile organic compounds and hazardous air pollutants, respectively.

Table 3.1.2.2-1. Emissions of Volatile Organic Compounds and Hazardous Air Pollutants from Chemical Use

POLLUTANT	EMISSIONS (TONS/YEAR)			
	1999	2000	2001	2002
Hazardous Air Pollutants	13.6	6.5	7.4	7.74
Volatile Organic Compounds	20	10.7	18.6	14.9

3.2 Liquid Effluents

LANL discharges wastewater via 21 outfalls operating under its NPDES permit. Based on discharge monitoring reports, as reported by LANL's Water Quality and Hydrology Group and on operational records when available, effluent flow through NPDES outfalls totaled an estimated 178.18 million gallons in CY 2002. This is an approximate increase of 54.15 million gallons over CY 2001 (124.04 million gallons). This volume of discharge is below the SWEIS ROD projection of 278.0 million gallons.

With implementation of the new NPDES permit on February 1, 2001, Water Quality and Hydrology is collecting and reporting actual flows that are being recorded by flow totalizers at most outfalls. At outfalls without totalizers, the flow is calculated based on instantaneous flow. Historically, instantaneous flow was measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day/seven-day week. Details on all NPDES noncompliance results are provided in the 2002 Environmental Surveillance Report (LANL, in preparation).

Key Facilities accounted for approximately 47 million gallons of the CY 2002 total. Comparison between the projected and actual number of outfalls by watershed can be found in Table 3.2-1. (Relevant details on the

Table 3.2-1. NPDES Permitted Outfalls by Watershed

WATERSHED	NUMBER OF OUTFALLS IDENTIFIED IN SWEIS	NUMBER OF OUTFALLS PROJECTED TO HAVE A DISCHARGE (SWEIS ROD)	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 1998	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 1999	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 2000	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 2001	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 2002	NUMBER OF PERMITTED OUTFALLS AS OF DECEMBER 31, 2002
Ancho	2	0	0	0	0	0	0	0
Cañada del Buey [a]	4	4	4	3	1	1	1	1
Chaquehui	1	0	0	0	0	0	0	0
Guaje [b]	7	7	7	6	0	0	0	0
Los Alamos	12	8	9	7	5	5	5	5
Mortandad	12	7	9	6	5	5	5	5
Pajarito [c]	17	11	13	2	0	0	0	0
Pueblo	1	1	1	1	0	0	0	0
Sandia [d]	10	7	8	6	4	4	5	5
Water [e]	21	10	15	5	5	5	5	5
Totals	87	55	66	36	20	20	21	21

[a] Includes Outfall 13S from the Sanitary Wastewater Systems Consolidation, which is registered as a discharge to Cañada del Buey or Sandia. The discharge is actually piped to TA-03 and ultimately discharged to Sandia Canyon via Outfall 001.
[b] Includes 04A-176 discharge to Rendija Canyon, a tributary to Guaje Canyon.
[c] Includes 06A-106 discharge to Three-Mile Canyon, a tributary to Pajarito Canyon.
[d] The number of outfalls increased during CY 2001 with the addition of the new Outfall 03A-199 (permit issued 2/1/2001).
[e] Includes 05A-055 discharge to Cañon de Valle, a tributary to Water Canyon.

NPDES permitted outfalls, including which watershed each outfall discharges to, are provided in Appendix D.) In Table 3.2-2, the number of gallons of discharge per watershed projected by the SWEIS is compared to the actual discharge per calendar year. Tables 3.2-3 and 3.2-4 compare the projected and actual number of outfalls by facility and the volume of discharge per facility projected by the SWEIS is compared to the actual discharge per calendar year.

Table 3.2-2. Discharges to Watersheds from NPDES Permitted Outfalls (Millions of Gallons)

WATERSHED	PROJECTED DISCHARGE (SWEIS ROD)	DISCHARGE 1998	DISCHARGE 1999	DISCHARGE 2000	DISCHARGE 2001	DISCHARGE 2002
Cañada del Buey	6.4	0	2.6	0	0	0
Guaje	0.7	1.2	1.7	0	0	0
Los Alamos	44.8	69.7	45.2	37.4	19.34	36.79
Mortandad	37.4	51.4	39.3	31.6	4.21	31.40
Pajarito	2.6	2.8	0	0	0	0
Pueblo	1.0	0.7	0.9	0	0	0
Sandia	170.8	67.1	213.2	180.2	100.38	108.58
Water	14.2	18.7	14.3	16.2	0.102	1.41
Totals	278.0	212.0	317.2	265.4	124.04	178.18

Of the 21 outfalls listed in the NPDES permit only 17 discharged during 2002, as was the case in 2001. Table 3.2-4 compares NPDES discharges by facility. The Non-Key Facilities showed a difference of about 11.3 million gallons between CY 2002 discharges and SWEIS ROD projections (130.83 million gallons versus 142.1 million gallons, respectively). For the Non-Key Facilities, discharge from Outfall 001 at the TA-03 power plant of 8.29 million gallons was higher than the 2001 discharge of 3.97 million gallons. Approximately 93 million gallons of the discharge from Outfall 001 at the power plant was attributable to treated sanitary effluent piped from Outfall 13S at TA-46 to TA-03 to be available as "makeup water" in the cooling towers. The combined flow of the sanitary waste treatment plant and the TA-3 steam plant account for about 77 percent of the total discharge from Non-Key Facilities and about 57 percent of all water discharged by the Laboratory.

For Key Facilities, LANSCE discharged approximately 24 million gallons for 2002, about 4 million gallons more than in 2001, accounting for about 51 percent of the total discharge from all Key Facilities (see Table 3.2-4). This percentage has decreased from the almost 82 percent in 2001 because other Key Facilities experienced an increase in discharge in 2002. The only Key Facilities to have decreased discharge in 2002 were the High Explosives Processing Facility and the RLWTF.

LANL has three principal wastewater treatment facilities—the sewage plant (Sanitary Wastewater System) at TA-46, the RLWTF at TA-50, and the HEWTF at TA-16. As discussed above, the sewage treatment plant at TA-46 processed about 93 million gallons of treated wastewater and sewage during 2002, all of which was pumped to the TA-3 power plant after treatment to provide makeup water for the cooling towers or to be discharged directly into Sandia Canyon via Outfall 001.

Table 3.2-3. NPDES Permitted Outfalls by Facility

FACILITY	NUMBER OF OUTFALLS IDENTIFIED IN SWEIS	NUMBER OF OUTFALLS PROJECTED TO HAVE A DISCHARGE (SWEIS ROD)	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 1998	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 1999	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 2000	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 2001	NUMBER OF PERMITTED OUTFALLS AS OF JANUARY 1, 2002	NUMBER OF PERMITTED OUTFALLS AS OF DECEMBER 31, 2002
Plutonium Complex	1	1	1	1	1	1	1	1
Tritium Facility	5	2	3	2	2	2	2	2
CMR Building	1	1	1	1	1	1	1	1
Sigma Complex	2	2	2	2	2	2	2	2
High Explosives Processing	22	11	16	3	3	3	3	3
High Explosives Testing [a]	15	7	10	3	2	2	2	2
LANSCE	6	5	6	4	4	4	4	4
HRL	1	1	1	1	0	0	0	0
Radiochemistry Facility	5	2	3	1	0	0	0	0
RLWTF	1	1	1	1	1	1	1	1
Pajarito Site	0	0	0	0	0	0	0	0
MSL	0	0	0	0	0	0	0	0
TFF	1	0	0	0	0	0	0	0
Machine Shops	0	0	0	0	0	0	0	0
Waste Management Operations	0	0	0	0	0	0	0	0
Non-Key Facilities [a, b]	27	22	22	17	4	4	5	5
Totals	87	55	66	36	20	20	21	21

[a] Outfall 03A-106 was incorrectly associated with a Non-Key Facility in the SWEIS. Starting with the 2002 Yearbook, Outfall 03A-106 is accounted for with High Explosives Testing.

[b] The number of outfalls increased during CY 2001 with the addition of the new Outfall 03A-199 (permit issued 2/1/2001). Please note that earlier Yearbooks incorrectly indicated that this outfall was added to the NPDES Permit in 2000.

Table 3.2-4. Discharges from NPDES Permitted Outfalls by Facility (Millions of Gallons)

FACILITY	PROJECTED DISCHARGE (SWEIS ROD)	DISCHARGE (1998)	DISCHARGE (1999)	DISCHARGE (2000)	DISCHARGE (2001)	DISCHARGE (2002)
Plutonium Complex	14.0	8.5	8.6	6.5	0.4053	2.82
Tritium Facility	0.3	13.7	9	8.6	0.3932	13.4
CMR Building	0.5	3.1	4.5	2.3	0.0209	0.76
Sigma Complex	7.3	12.7	5.9	3.9	0.0555	2.00
High Explosives Processing	12.4	17.1	0.2	0.1	0.036	0.03
High Explosives Testing	3.6	1.8	14.3	16.1	0.006638	1.38
LANSCE	81.8	53.4	37.2	30.5	20.45	24.04
HRL	2.5	0.0	0	0	0	0
Radiochemistry Facility	4.1	0.0	0	0	0	0
RLWTF	9.3	6.1	5.3	4.9	3.6	2.92
Pajarito Site	0	0	0	0	0	0
MSL	0	0	0	0	0	0
TFF	0	0	0	0	0	0
Machine Shops	0	0	0	0	0	0
Waste Management Operations	0	0	0	0	0	0
Non-Key Facilities	142.1	95.2	232	192.5	99.01	130.83
Totals	278.0	212.0	317.2	265.4	124.04	178.18

The RLWTF, Building 50-01, Outfall 051, discharges into Mortandad Canyon. During 2002, about 2.9 million gallons of treated radioactive liquid effluent, about 0.7 million gallons less than 2001, were released to Mortandad Canyon from the RLWTF, compared to 9.3 million gallons projected by the SWEIS ROD. The TA-16 HEWTF discharged about 0.0275 million gallons compared to 12.4 projected by the SWEIS ROD.

Treated wastewater released from LANL's NPDES outfalls rarely leaves the site. However, the NPDES permit program also regulates storm water discharges from certain activities. During CY 2002, LANL operated about 75 stream-monitoring and partial-record storm water-monitoring stations located in 17 watersheds. Data gathered from these stations show that surface water, including storm water, occasionally flows off of DOE property. Flow measurements and water quality data for surface water are detailed in LANL's annual reports, Environmental Surveillance at Los Alamos (an example is LANL 2001c) and Surface Water Data at Los Alamos National Laboratory (an example is LANL 2000c).

Overview of the NPDES Outfalls History

The number of outfalls listed in the NPDES permit had decreased from 88 at the end of 1996 to 66 at the end of 1997. Even more substantial reductions occurred during 1998, and the number of permitted outfalls had decreased to just 36 by the end of December 1998. Most of the reductions during both 1997 and 1998 were from the High Explosives Processing Key Facility (six eliminated in 1997, and 13 eliminated in 1998) and High Explosives Testing Key Facility (five eliminated in 1997, and seven eliminated in 1998). Outfall reductions for both High Explosives Key Facilities largely resulted from redirecting some flows, such as cooling tower discharge waters, to the sewage plant at TA-46, and from the routing of high explosives contaminated flows through the HEWTF, which has but a single outfall. The HEWTF began treatment operations in 1997.

At the end of 1999, the number of outfalls listed in the NPDES permit had decreased by 16. Three of the 16 outfalls eliminated during 1999, Outfalls 03A-040, 03A-045, and 06A-106, were associated with the HRL, Radiochemistry Laboratory, and High Explosives Testing Key Facilities, respectively; and, each was

Stabilization measures below the deleted TA-16 Building 260 Outfall

eliminated after cessation of source activities and processes or redirecting flows to other outfalls, primarily to the sanitary system. Most of the reductions (9 of the 16) during 1999 were the result of transferring the water supply system from the DOE to Los Alamos County. Those outfalls were removed from LANL's NPDES permit and added to the Los Alamos County NPDES permit application. Four other water supply wells were taken out of production, their pumping equipment removed, and their outfalls eliminated.

This major modification project, elimination and/or rerouting of NPDES outfalls, was completed in 1999, bringing the total number of permitted outfalls down from the 55 identified by the SWEIS ROD to 20. During 2000, Outfall 03A-199, which will serve the TA-3-1837 cooling towers, was included in the new NPDES permit issued by EPA on December 29, 2000; however, the effective date of the permit was February 1, 2001. This brings the total number of permitted outfalls up to 21. This new outfall (03A-199) will discharge to an unnamed tributary of Sandia Canyon and will be included in future totals for the Non-Key Facilities. It has yet to discharge. While the volume of water discharged by the Laboratory in CY 2000 was reduced overall, the largest apparent reductions were primarily attributed to fewer outfalls being reported under the Laboratory's NPDES permit coupled with more accurate record keeping.

3.3 Solid Radioactive and Chemical Wastes

Because of the complex array of facilities and operations, LANL generates a wide variety of waste types including solids, liquids, semi-solids, and contained gases. These waste streams are variously regulated as solid, hazardous, low-level radioactive, TRU, or wastewater by a host of State and Federal regulations. The institutional requirements relating to waste management at LANL are located in a series of documents that are part of the Laboratory Implementation Requirements. These requirements specify how all process wastes and contaminated environmental media generated at LANL are managed. Wastes are managed from planning for waste generation for each new project through final disposal or permanent storage of those wastes. This ensures that LANL meets all requirements including DOE Orders, Federal and State regulations, and LANL permits.

LANL's waste management operation captures and tracks data for waste streams, regardless of their points of generation or disposal. This includes information on the waste generating process; quantity; chemical and physical characteristics of the waste; regulatory status of the waste; applicable treatment and disposal standards; and the final disposition of the waste. The data are ultimately used to assess operational efficiency, help ensure environmental protection, and demonstrate regulatory compliance.

LANL generates radioactive and chemical wastes as a result of research, production, maintenance, construction, and environmental restoration activities as shown in Table 3.3-1. Waste generators are assigned to one of three categories—Key Facilities, Non-Key Facilities, and the ER Project. Waste types are defined by differing regulatory requirements. No distinction has been made between routine wastes, those generated from ongoing operations, and non-routine wastes such as those generated from the decontamination and decommissioning of buildings.

Table 3.3-1 presents a summary of the wastes quantities generated from 1998 through 2002. As shown in Table 3.3-1, quantities of wastes in 2002 were appreciably below projections.

In general, waste quantities from operations at the Key Facilities were below ROD projections for nearly all waste types, reflecting normal levels of operations at the Key Facilities. Waste minimization efforts put forth by the Environmental Stewardship Office are beginning to show a LANL-wide trend in overall waste reduction across most categories. There have been improvements made in various facility processes to try and minimize waste generation. Additionally, other processes are substituting non-hazardous chemicals for commonly used hazardous chemicals in an effort to improve effluent quality.

Table 3.3-1. LANL Waste Types and Generation

WASTE TYPE	UNITS	SWEIS ROD PROJECTION	1998	1999	2000	2001	2002
Chemical	10^3 kg/yr	3,250	1,771	15,441 [a]	27,674 [b]	27,583 [c]	602
LLW	m^3/yr	12,200	1,837	1,678	4,229	2,597	7,310
MLLW	m^3/yr	632	71.4	20.65	598.23	58.23	20.54
TRU	m^3/yr	333	108.1	143.2	124.8	117.0	119.1
Mixed TRU	m^3/yr	115	34	87.2	88.6	48.1	87.01

[a] Clean-up efforts of the ER Project accounted for the large waste volumes, almost 95% of the total. Most of the 14.5 million kilograms of chemical waste generated by the ER Project resulted from remediation of PRSs at TA-16, particularly MDA-P. MDA-P was exhumed as part of a clean-closure under the RCRA.

[b] Clean-up efforts of the ER Project accounted for the large waste volumes. The continuing clean-up of MDA-P, remediation of PRS 3-0569(c) at the upper end of Sandia Canyon in TA-03, and the accelerated clean-up of MDA-R due to the Cerro Grande Fire, were responsible for most of the chemical waste generation.

[c] The continuing clean-up efforts at MDA-P and PRS 3-056(c) accounted for most of the ER Project generated waste in 2001.

3.3.1 Construction and Demolition Debris (Previously Identified in Yearbooks as Industrial Solid Wastes)

As projected by the SWEIS ROD, chemical waste includes not only construction and demolition debris, but also all other nonradioactive wastes passing through the Solid Radioactive and Chemical Waste Facility. In addition, construction and demolition debris is a component of those chemical wastes that in most cases are sent directly to offsite disposal facilities. For CY 2002, construction and demolition debris was 17 percent of the total chemical waste generated and consisted primarily of asbestos and construction debris from decontamination and decommissioning projects. Construction and demolition debris is disposed of in solid waste landfills under regulations promulgated pursuant to Subtitle D of RCRA. (Note: Hazardous wastes are regulated pursuant to Subtitle C of RCRA.)

3.3.2 Chemical Wastes

Chemical waste generation in 2002 was slightly more than one-half of the waste volumes projected by the SWEIS ROD. Table 3.3.2-1 summarizes chemical waste generation from 1998 through 2002.

ER Project wastes accounted for 66 percent of the total chemical wastes generated. The ER projects that contributed to the waste generated were the removal of contaminated soil at the TA-16-260 outfall and the completion of the cleanup of MDA-P.

Table 3.3.2-1. Chemical Waste Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD PROJECTION	1998	1999	2000	2001	2002
Key Facilities	10^3 kg/yr	600	120	49	1,121	513	267
Non-Key Facilities	10^3 kg/yr	650	1,506 [a]	765	368	1,255 [b]	334
ER Project	10^3 kg/yr	2,000	144	14,630 [c]	26,185 [d]	25,816 [e]	1,133
LANL	10^3 kg/yr	3,250	1,771	15,441	27,674	27,583	1,734

[a] At the Non-Key Facilities in 1998, chemical waste quantities exceeded projections because of a LANL-wide campaign to identify and dispose of chemicals no longer used or needed.

[b] At the Non-Key Facilities in 2001, the increased activity from new construction generated a higher quantity of chemical waste.

[c] Clean-up efforts of the ER Project accounted for the large waste volumes, almost 95% of the total. Most of the 14.5 million kilograms of chemical waste generated by the ER Project resulted from remediation of PRSs at TA-16, particularly MDA-P. MDA-P was exhumed as part of a clean-closure under the RCRA.

[d] Clean-up efforts of the ER Project accounted for the large waste volumes. The continuing clean-up of MDA-P, remediation of PRS 3-056(c) at the upper end of Sandia Canyon in TA-03, and the accelerated clean-up of MDA-R due to the Cerro Grande Fire, were responsible for most of the chemical waste generation.

[e] The continuing clean-up efforts at MDA-P and PRS 3-056(c) accounted for most of the ER Project generated waste in 2001.

Radiological worker in respirator and personal protective equipment

3.3.3 Low-Level Radioactive Wastes

Table 3.3.3-1 summarizes LLW generation from 1998 through 2002. LLW generation in 2002 was less than 60 percent of waste volumes projected by the SWEIS ROD. During 2002, Key Facilities produced less than one-sixth the volume of LLW projected in the SWEIS ROD.

Significant differences occurred at the CMR Building (389 cubic meters versus 1,820 cubic meters per year projected by the SWEIS ROD), the Sigma Complex (960 cubic meters projected versus 202 actual), and High Explosives Testing (940 cubic meters projected versus 0 actual). In addition, LANSCE generated lower volumes than projected (1,085 cubic meters projected versus 0 actual) because decommissioning and renovation of Experimental Area A did not occur. Normal to low workloads accounted for lower waste volumes at the other Key Facilities. LLW generation at Non-Key Facilities slightly exceeded the SWEIS ROD. This is explained by heightened activities and new construction at Non-Key Facilities.

Table 3.3.3-1. LLW Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD PROJECTION	1998	1999	2000	2001	2002
Key Facilities	m^3/yr	7,450	707	1,042	1,222	1,407	1,292
Non-Key Facilities	m^3/yr	520	386	350	2,781 [a]	569 [a]	534 [a]
ER Project	m^3/yr	4,260	744	286	226	621	5,484
LANL	m^3/yr	12,230	1,837	1,678	4,229	2,597	7,310

[a] LLW generation at the Non-Key Facilities slightly exceeds the SWEIS ROD due to heightened activities and new construction.

3.3.4 Mixed Low-Level Radioactive Wastes

Generation in 2002 approximated one-thirtieth of the MLLW volumes projected by the SWEIS ROD. Table 3.3.4-1 examines these wastes by generator categories from 1998 through 2002. With the exception of 2000, the ER Project has generated much less MLLW than had been projected.

Table 3.3.4-1. MLLW Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD PROJECTION	1998	1999	2000	2001	2002
Key Facilities	m^3/yr	54	7	17	11	20	12
Non-Key Facilities	m^3/yr	30	55	3	10	9	9
ER Project	m^3/yr	548	9	1	577 [a]	29	0
LANL	m^3/yr	632	71	21	598	58	21

[a] Almost all of the MLLW generated in 2000 resulted from the remediation of MDA-P.

3.3.5 Transuranic Wastes

Generation in 2002 approximated one-third of the TRU waste volumes projected by the SWEIS ROD. As projected in the ROD, TRU wastes are expected to be generated almost exclusively in four facilities (the Plutonium Facility Complex, the CMR Building, the RLWTF, and the Solid Radioactive and Chemical Waste Facility). TRU waste generated at the Non-Key Facilities during 2000, 2001, and 2002 all resulted from the OSR Project. Because this waste comes from shipping and receiving, it is attributed to that location as the point of generation. Table 3.3.5-1 examines TRU wastes by generator categories from 1998 through 2002.

The ER Project did not produce any TRU wastes in 2002.

High bay in the RANT facility with a waste shipment for WIPP

Waste shipment desitined for WIPP

Table 3.3.5-1. Transuranic Waste Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD PROJECTION	1998	1999	2000	2001	2002
Key Facilities	m^3/yr	322	108	143	122	92	82
Non-Key Facilities	m^3/yr	0	0	0	3	25	37
ER Project	m^3/yr	11	0	0	0	0	0
LANL	m^3/yr	333	108	143	125	117	119

3.3.6 Mixed Transuranic Wastes

Generation in 2002 was less than one-third the mixed TRU waste volumes projected by the SWEIS ROD. As projected, mixed TRU wastes are expected to be generated at only two facilities–the Plutonium Facility Complex and the CMR Building. Table 3.3.6-1 examines these wastes by generator categories from 1998 through 2002.

Both the Plutonium Facility Complex (30 cubic meters actual versus 102 cubic meters per year projected by the SWEIS ROD) and the CMR Building (13 cubic meters projected versus one actual) produced less mixed TRU waste than projected because full-scale production of war reserve pits had not begun.

Table 3.3.6-1. Mixed Transuranic Waste Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD PROJECTION	1998	1999	2000	2001	2002
Key Facilities	m^3/yr	115	34	72	26	48	87
Non-Key Facilities	m^3/yr	0	0	15	63	0	0
ER Project	m^3/yr	0	0	0	0	0	0
LANL	m^3/yr	115	34	87	89	48	87

3.4 Utilities

Ownership and distribution of utility services continue to be split between NNSA and Los Alamos County. NNSA owns and distributes most utility services to LANL facilities, and the County provides these services to the communities of White Rock and Los Alamos. Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.

3.4.1 Gas

There was a change in ownership to the DOE Natural Gas Transmission Line in August 1999. DOE sold 130 miles of gas pipeline and metering stations to the Public Service Company of New Mexico (PNM). This gas pipeline traverses the area from Kutz Canyon Processing Plant south of Bloomfield, New Mexico, to Los Alamos. Approximately 4 miles of the gas pipeline are within LANL. Table 3.4.1-1 presents gas usage by LANL for FY 1991 through FY 2002. Approximately 84 percent of the gas used by LANL was used for heating (both steam and hot air). The remainder was used for electrical production. LANL electrical generation is used to fill the difference between peak loads and the electric import capability.

As shown in Table 3.4.1-1, total gas consumption for FY 2002 was less than projected by the SWEIS ROD. During FY 2002, less natural gas was used for heating because of the drought and warmer than normal weather pattern, and there was less electric generation at the TA-03 power plant as compared to FY 2001. Table 3.4.1-2 illustrates steam production from FY 1996 through FY 2002.

Table 3.4.1-1. Gas Consumption (decatherms[a]) at LANL/Fiscal Years 1991-2002

FISCAL YEAR	SWEIS ROD	TOTAL LANL CONSUMPTION	TOTAL USED FOR ELECTRIC PRODUCTION	TOTAL USED FOR HEAT PRODUCTION	TOTAL STEAM PRODUCTION
1991	1,840,000	1,480,789	64,891	1,415,898	803,168
1992	1,840,000	1,833,318	447,427	1,385,891	744,300
1993	1,840,000	1,843,936	411,822	1,432,113	1,192,803
1994	1,840,000	1,682,180	242,792	1,439,388	1,094,812
1995	1,840,000	1,520,358	111,908	1,408,450	967,587
1996	1,840,000	1,358,505	11,405	1,347,100	Table 3.4.1-2
1997	1,840,000	1,444,385	96,091	1,348,294	Table 3.4.1-2
1998	1,840,000	1,362,070	128,480	1,233,590	Table 3.4.1-2
1999	1,840,000	1,428,568	241,490	1,187,078	Table 3.4.1-2
2000	1,840,000	1,427,914	352,126	1,075,788	Table 3.4.1-2
2001	1,840,000	1,492,635	273,312	1,219,323	Table 3.4.1-2
2002	1,840,000	1,325,639	212,976	1,112,663	Table 3.4.1-2

[a] A decatherm is equivalent to 1,000 to 1,100 cubic feet of natural gas.

Table 3.4.1-2. Steam Production at LANL/Fiscal Years 1996-2002

FISCAL YEAR	TA-3 STEAM PRODUCTION (klb [a])	TA-21 STEAM PRODUCTION (klb)	TOTAL STEAM PRODUCTION (klb)
1996	451,363	54,033	701,792
1997	413,684	50,382	464,066
1998	377,883	37,359	415,242
1999	576,548 [b]	29,468	606,016
2000	634,758 [b]	27,840	662,598
2001	531,763 [b]	29,195	560,958
2002	478,007 [b]	26,206	504,213

[a] klb: Thousands of pounds

[b] TA-03 steam production has two components: that used for electric production (167,767 klb in 2002) and that used for heat (310,240 klb in 2002).

3.4.2 Electricity

LANL is supplied with electrical power through a partnership arrangement with Los Alamos County, known as the Los Alamos Power Pool, which was established in 1985. The NNSA and Los Alamos County have entered into a 10-year contract known as the Electric Coordination Agreement whereby each entity's electric resources are consolidated or pooled. Recent changes (as of August 1, 2002) in transmission agreements with PNM have resulted in the removal of contractual restraints on Power Pool resources import capability. Import capacity is now limited only by the physical capability (thermal rating) of the transmission lines that is approximately 110 to 120 megawatts from a number of hydroelectric, coal, and natural gas power generators throughout the western United States. Onsite electric generating capability for the Power Pool is limited by the existing TA-03 steam and electric power plant, which is capable of producing up to 20 megawatts of electric power that is shared by the Pool under contractual arrangement.

The ability to accept additional power into the Los Alamos Power Pool grid is limited by the regional electric import capability of the existing northern New Mexico power transmission system. In recent years, the population growth in northern New Mexico, together with expanded industrial and commercial usage, has greatly increased power demands on the northern New Mexico regional power system. Several proposals for bringing additional power into the region have been considered. Power line corridor locations remain under consideration, but it is uncertain when any new regional power lines would be constructed and become serviceable.

Power Plant Complex

In CY 2002, an environmental assessment (DOE 2002a), "Environmental Assessment for Installation and Operation of Combustion Turbine Generators at Los Alamos National Laboratory, Los Alamos, New Mexico," (DOE/EA-1430) was written to analyze the effects of increasing the TA-03 steam and electric power plant generating capability by an additional 40 megawatts of power in the near future. Based on this environmental assessment, DOE issued a Finding of No Significant Impact in December 2002. Installation of the first combustion turbine generator at the TA-03 power plant is scheduled to occur during the FY 2003 to FY 2004 time frame.

Table 3.4.2-1 shows peak demand and Table 3.4.2-2 shows annual use of electricity from FY 1991 through FY 2002. LANL's electrical energy use remains below projections in the SWEIS ROD. The ROD projected peak demand to be 113,000 kilowatts (with 63,000 kilowatts being used by LANSCE and about 50,000 kilowatts being used by the rest of the Laboratory). In addition, the ROD projected annual use to be 782,000 megawatt hours with 437,000 megawatt hours being used by LANSCE and about 345,000 megawatt

Table 3.4.2-1. Electric Peak Coincident Demand/Fiscal Years 1991-2002

CATEGORY	LANL BASE	LANSCE	LANL TOTAL	COUNTY TOTAL	POOL TOTAL
SWEIS ROD	50,000[a]	63,000	113,000	Not projected	Not projected
FY 1991	43,452	32,325	75,777	11,471	84,248
FY 1992	39,637	33,707	73,344	12,426	85,770
FY1993	40,845	26,689	67,534	12,836	80,370
FY 1994	38,354	27,617	65,971	11,381	77,352
FY 1995	41,736	24,066	65,802	14,122	79,924
FY 1996	41,799	20,799	62,598	13,160	75,758
FY 1997	37,807	24,846	62,653	13,661	76,314
FY 1998	39,064	24,773	63,837	13,268	77,105
FY 1999	49,509	24,510	74,019	14,399	82,885
FY 2000	48,225	24,594	72,819	15,176	80,623
FY 2001	50,146	21,517	71,663	14,583	85,461
FY 2002	45,809	20,938	66,747	16,653	83,400

[a] All figures in kilowatts.

Table 3.4.2-2. Electric Consumption/Fiscal Years 1991-2002

CATEGORY	LANL BASE	LANSCE	LANL TOTAL	COUNTY	POOL TOTAL
SWEIS ROD	345,000[a]	437,000	782,000	Not projected	Not projected
FY 1991	282,994	89,219	372,213	86,873	459,086
FY 1992	279,208	102,579	381,787	87,709	469,496
FY 1993	277,005	89,889	366,894	89,826	456,720
FY 1994	272,518	79,950	352,468	92,065	444,533
FY 1995	276,292	95,853	372,145	93,546	465,691
FY 1996	277,829	90,956	368,785	93,985	462,770
FY 1997	258,841	138,844	397,715	96,271	493,986
FY 1998	262,570	64,735	327,305	97,600	424,905
FY 1999	255,562	113,759	369,321	106,547	475,868
FY 2000	263,970	117,183	381,153	112,216	493,369
FY 2001	294,169	80,974	375,143	116,043	491,186
FY 2002	299,422	94,966	394,398	121,013	515,401

[a] All figures in megawatt-hours.

hours being used by the rest of LANL. Actual use has fallen below these values, and the projected periods of brownouts have not occurred. However, on a regional basis, failures in the PNM system have caused blackouts in northern New Mexico and elsewhere.

In the third quarter of CY 2002, LANL completed construction of the new Western Technical Area (WTA) 115/13.8-kV substation at TA-06. The main power transformer for WTA, rated at up to 50 mega volt amperes, was delivered in 2001. WTA will provide LANL and the Los Alamos town site with redundancy in bulk power transformation facilities to guard against losses of either the Eastern Technical Area Substation or the TA-03 Substation (DOE 2000).

Operations at several of the large LANL loads changed during 2002. Notably the SCC operations increased to about 3 megawatts of load in 2002. Additional computing facilities are to be added to SCC in 2003, resulting in the addition of another 1 to 2 megawatts of load.

LANSCE operations were extended in operating time in 2002 due to extended programmatic operations and an increase of direct operating funds. This represented no significant increase in the total peak demand of loading on the LANL power system in 2002, but did result in an increase of 13,992 megawatt hours (a 17 percent increase) in LANSCE energy consumption over 2001. It is expected that operating funds will be restored in future years such that the LANSCE operations will be restored to the level of prior years operations at high power levels.

LEDA funding was curtailed in 2001 resulting in the loss of 2 to 4 megawatts of load. This situation continued through 2002. LEDA will continue in mothballed maintenance mode until a new sponsor is secured, hopefully as early as 2004.

The National High Magnetic Field Laboratory remained out of operation during 2002. The 60-Tesla super conducting magnet that failed in 2000 is in redesign and reconstruction and should be operational again by 2003. This represents a temporary reduction of approximately 2 megawatts load in 2002.

The DARHT facility began commissioning operations of its first axis in 2001. The load level is about 2 megawatts for the first axis. The second axis became operational in 2002, representing an additional 2 megawatts of new load to LANL.

Mitigation of the damage to LANL utilities from the Cerro Grande Fire was for the most part completed in 2002. Tree trimming clearance for the power line corridors will take many more years to bring areas up to the desired LANL standard.

3.4.3 Water

Before September 8, 1998, DOE supplied all potable water for LANL, Bandelier National Monument, and Los Alamos County, including the towns of Los Alamos and White Rock. This water was obtained from DOE's groundwater right to withdraw 5,541.3 acre-feet per year or about 1,806 million gallons of water per year from the main aquifer. On September 8, 1998, DOE leased these water rights to Los Alamos County. This lease also included DOE's contractual annual right obtained in 1976 to 1,200 acre-feet per year of San Juan-Chama Transmountain Diversion Project water. The lease agreement was effective for three years until September 8, 2001, although the County could exercise an option to buy sooner than three years. In September 2001, DOE officially turned over the water production system to Los Alamos County. LANL is now considered a customer to Los Alamos County. Los Alamos County is continuing to pursue the use of San Juan-Chama water as a means of maintaining those water rights. Los Alamos County is also proceeding with an engineering study and will have more information after that is complete.

LANL is in the process of installing additional water meters and a Supervisory Control and Data Acquisition/Equipment Surveillance System on the distribution system to keep track of water usage and to determine the specific water use for various applications. Data are being accumulated to establish a basis for conserving water. LANL continues to maintain the distribution system by replacing portions of the over-50-year-old system as problems arise. In remote areas, LANL is trying to automate the monitoring of the system to be more responsive during emergencies such as the Cerro Grande Fire.

Table 3.4.3-1 shows water consumption in thousands of gallons from CY 1992 through CY 2002. LANL consumed about 325 million gallons during CY 2002. Under the expanded alternative, water use for LANL was projected to be 759 million gallons per year. Actual use by LANL in 2002 was about 434 million gallons less than the projected consumption and about 217 million gallons less than the 542 million gallons per year under the agreement with the County. The calculated NPDES discharge of 178 million gallons (Table 3.2-2) was about 55 percent of the total LANL usage of 324 million gallons.

Table 3.4.3-1. Water Consumption (thousands of gallons) for Calendar Years 1992-2002

CATEGORY	LANL	LOS ALAMOS COUNTY	TOTAL
SWEIS ROD	759,000	Not Projected	Not Applicable
CY 1992	547,535	982,132	1,529,667
CY 1993	467,880	999,863	1,467,743
CY 1994	524,791	913,430	1,438,221
CY 1995	337,188	1,022,126	1,359,314
CY 1996	340,481	1,035,244	1,375,725
CY 1997	488,252	800,019	1,288,271
CY 1998	461,350	Not Available [a]	Not Available [a]
CY 1999	453,094	Not Available [a]	Not Applicable
CY 2000	441,000	Not Available [a]	Not Available [a]
CY 2001	393,123	Not Available [a]	Not Applicable
CY 2002	324,514	Not Available [a]	Not Available [a]

[a] On September 8, 1998, Los Alamos County acquired the water supply system and LANL no longer collects this information.

The County now bills LANL for water, and all future water use records maintained by LANL will be based on those billings. The distribution system used to supply water to LANL facilities now consists of a series of reservoir storage tanks, pipelines, and fire pumps. The LANL distribution system is gravity fed with pumps for high-demand fire situations at limited locations.

3.5 Worker Safety

Working conditions at LANL have remained essentially the same as those identified in the SWEIS. DARHT and Atlas—major construction activities—were reflected in the SWEIS analysis, and several other major facilities are also under construction for which separate NEPA documentation was prepared. More than half the workforce remains routinely engaged in activities that are typical of office and computing industries. Much of the remainder of the workforce is engaged in light industrial and bench-scale research activities. Approximately one-tenth of the general workforce at LANL continues to be engaged in production, services, maintenance, and research and development within Nuclear and Moderate Hazard facilities.

3.5.1 Accidents and Injuries

Table 3.5.1-1 summarizes occupational injury and illness rates from CY 1996 through CY 2002. Occupational injury and illness rates for workers at LANL during CY 2002 continue to be small as shown in Table 3.5.1-1. These rates correlate to 260 reportable injuries and illnesses during the year, or less than 51 percent of the 507 cases projected by the SWEIS ROD.

Table 3.5.1-1. Total Recordable and Lost Workday Case Rates at LANL

CALENDAR YEAR	UC WORKERS ONLY		LANL (ALL WORKERS)	
	TRI [a]	LWC [b]	TRI	LWC
1996	4.53	2.88	5.88	3.86
1997	4.41	2.66	5.55	3.45
1998	2.90	1.30	3.35	1.77
1999	2.37	1.24	2.52	1.37
2000	1.53	0.62	1.97	0.94
2001	1.62	0.55	1.96	0.91
2002	2.16	1.24	2.39	1.46

[a] TRI: Total recordable incident rate, number per 200,000 hours worked.
[b] LWC: Lost workday cases, number of cases per 200,000 hours worked.

3.5.2 Ionizing Radiation and Worker Exposures

Occupational radiation exposures for workers at LANL from CY 1998 through CY 2002 are summarized in Table 3.5.2-1. The collective Total Effective Dose Equivalent, or collective TEDE, for the LANL workforce during 2002 was 164 person-rem, considerably lower than the workforce dose of 704 person-rem projected for the ROD.

Thermoluminiscent dosimeter

Table 3.5.2-1. Radiological Exposure to LANL Workers

PARAMETER	UNITS	SWEIS ROD	VALUE FOR 1998	VALUE FOR 1999	VALUE FOR 2000	VALUE FOR 2001	VALUE FOR 2002
Collective TEDE (external + internal)	person-rem	704	161	131	196	113	164
Number of workers with non-zero dose	number	3,548	1,839	1,427	1,316	1,332	1,696
Average non-zero dose:							
• external + internal radiation exposure	millirem	Not projected	87.4	92	149	85	96
• external radiation exposure only	millirem	Not projected	Not projected	90	65	83	95

These reported doses in Table 3.5.2-1 for 2002 could change with time. Estimates of committed effective dose equivalent in many cases are based on several years of bioassay results, and as new results are obtained the dose estimates may be modified accordingly.

Of the 164 person-rem collective TEDE reported for 2002, external radiation and tritium exposure accounted for 160 person-rem. The remaining 4 person-rem are from internal exposure.

The five highest individual doses in CY 2002 were 2.214, 1.897, 1.813, 1.644, and 1.619 rem. These doses are well below the 5 rem/year legal limit. The 2.214 rem dose was approved in advance to be above the 2 rem/year performance goal by the ALARA [as low as reasonably achievable] Steering Committee in accordance with LANL procedures. Table 3.5.2-2 summarizes the highest individual dose data for CY 1998 through CY 2002. This is the first time that the information for CY 1998 and CY 1999 has appeared in a yearbook. Also, the data for CY 2000 and CY 2001 have been expanded.

Table 3.5.2-2. Highest Individual Doses from External Radiation to LANL Workers (rem)

CY 1998 [a]	CY 1999 [a]	CY 2000 [b]	CY 2001 [c]	CY 2002
1.846	1.910	1.048	1.284	2.214
1.804	1.866	1.013	1.225	1.897
1.581	1.783	0.905	1.123	1.813
1.536	1.755	0.828	1.002	1.644
1.523	1.749	0.815	0.934	1.619

[a] Data for CY 1998 and CY 1999 have been added this year.

[b] The CY 2000 data for only the two highest doses appeared in previous yearbooks. The TEDEs for these individuals are elevated due to a single unplanned incident at TA-55 in March 2000, as discussed in the SWEIS Yearbook-2000. This was an accidental exposure and so outside the SWEIS ROD projection.

[c] During CY 2001, four individual doses were greater than 1 rem, but less than 2 rem.

Comparison with the SWEIS Baseline. The collective TEDE for CY 2002 is 79 percent of the 208 person-rem of 1993–1995 used as the baseline in the ROD. Several factors were responsible for this, the more important of which include the following:

Work and Workload. Changes in workload and types of work from 1993–1995 have resulted in a decreased collective TEDE. The SWEIS used the 1993–1995 time frame as its base. Of special importance is that the radionuclide power source for the Cassini spacecraft was being constructed at TA-55 during the baseline time period. This project incurred higher neutron exposure for the workers. After the project was completed in the 1995–1996 time frame, the LANL collective TEDE was reduced.

ALARA Program. Improvements from the ALARA program, such as the continuing addition of shielding at LANL workplaces, have also resulted in lower worker exposures and consequently a reduced collective TEDE for the Laboratory.

Improved Personnel Dosimeter. An improved personnel dosimeter was introduced on a Laboratory-wide basis in April 1998. The dosimeter's increased accuracy in measuring the external neutron dose removed some conservatism that had been previously used in estimating the dose, which resulted in lower reported doses. (The actual dose did not change, but the ability to measure it accurately improved.)

Comparison with the Projected TEDE in the ROD. In addition to being less than the collective TEDE levels in 1993–1995, the collective TEDE for 2002 is less than the TEDE projected in the ROD. The implementation of war reserve pit manufacture, which was approved in the ROD, has not become fully operational at LANL. This contributed to lower doses than projected. The collective dose may increase once the pit manufacture program is fully implemented.

Collective TEDEs for Key Facilities. In general, collective TEDEs by Key Facility or technical area are difficult to determine because these data are collected at the group level, and members of many groups and/or organizations receive doses at several locations. The fraction of a group's collective TEDE coming from a specific Key Facility or technical area can only be estimated. For example, personnel from the Health Physics Operations group and JCNNM are distributed over the entire Laboratory, and these two organizations account for a significant fraction of the total LANL collective TEDE. Nevertheless, the group working at TA-18 is well defined, and the 2002 collective TEDE for the Pajarito Site Key Facility is 1.4 person-rem.

Many of the groups working at TA-55 have been reorganized to include workers at other facilities. However, approximately 95 percent of the collective TEDE that these groups incur is estimated to come from operations at TA-55. The total collective TEDE for these groups in CY 2002, plus the estimated collective TEDE for the health physics personnel and JCNNM personnel working at TA-55, is 108 person-rem, which is 66 percent of the total Laboratory TEDE of 164 person-rem.

3.6 Socioeconomics

The LANL-affiliated workforce continues to include UC employees and subcontractors. Table 3.6-1 summarizes the workforce data from CY 1996 through CY 2002. As shown in Table 3.6-1, the number of employees has exceeded SWEIS ROD projections. The 13,524 employees at the end of CY 2002 are 2,173 more employees than SWEIS ROD projections of 11,351. SWEIS ROD projections were based on 10,593 employees identified for the index year (employment as of March 1996). The 13,524 total employees at the end of CY 2002 reflect an increase of 1,144 employees over the 12,380 employees reported in the 2001 Yearbook (LANL 2002a).

Table 3.6-1. LANL-Affiliated Workforce

CATEGORY	UC EMPLOYEES	TECHNICAL CONTRACTOR	NON-TECHNICAL CONTRACTOR	JCNNM	PTLA	TOTAL
SWEIS ROD [a]	8,740	795	Not projected [b]	1,362	454	11,351
CY 1996	8,256	877	269	1,358	395	11,155
CY 1997	8,503	911	328	1,330	424	11,496
CY 1998	8,945	950	271	1,393	449	12,008
CY 1999	9,185	1,064	214	1,461	488	12,412
CY 2000	8,861	1,010	200	1,430	514	12,015
CY 2001	9,179	1,024	197	1,487	493	12,380
CY 2002	9,923	1,149	204	1,658	590	13,524

[a] Total number of employees was presented in the SWEIS, the breakdown had to be calculated based on the percentage distribution shown in the SWEIS for the base year.

[b] Data were not presented for non-technical contractors or consultants.

These employees have had a positive economic impact on northern New Mexico. Through 1998, DOE published a report each fiscal year regarding the economic impact of LANL on north-central New Mexico as well as the State of New Mexico (Lansford et al. 1997, 1998, 1999). The findings of these reports indicate that LANL's activities resulted in a total increase in economic activity in New Mexico of about $3.2 billion in 1996, $3.9 billion in 1997, and $3.8 billion in 1998. The publication of this report was discontinued after FY 1998 due to funding deficiencies. However, based on number of employees and payroll, it is expected that LANL's 2002 economic contribution was similar to the three years analyzed for DOE.

The residential distribution of UC employees reflects the housing market dynamics of three counties. As seen in Table 3.6-2, 88 percent of the UC employees continued to reside in the three counties of Los Alamos, Rio Arriba, and Santa Fe.

Table 3.6-2. County of Residence for UC Employees [a]

CALENDAR YEAR	LOS ALAMOS	RIO ARRIBA	SANTA FE	OTHER NM	TOTAL NM	OUTSIDE NM	TOTAL
SWEIS ROD [b]	4,279	1,762	1,678	671	8,390	350	8,740
CY 1996	4,539	1,274	1,524	422	7,759	497	8,256
CY 1997	4,666	1,323	1,599	436	8,024	479	8,503
CY 1998	4,831	1,454	1,688	469	8,442	503	8,945
CY 1999	4,833	1,523	1,805	529	8,690	495	9,185
CY 2000	4,663	1,509	1,778	510	8,460	401	8,861
CY 2001	4,669	1,615	1,828	571	8,683	496	9,179
CY 2002	4,909	1,733	2,065	659	9,366	557	9,923

[a] Includes both Regular and Temporary employees, including students who may not be at LANL for much of the year.
[b] Total number of employees was presented in the SWEIS, the breakdown had to be calculated based on the percentage distribution shown in the SWEIS for the base year.

Science outreach

Table 3.6-3. UC Employee[a] Index for Key Facilities

KEY FACILITY	SWEIS ROD	CY 1996	CY 1997	CY 1998	REFERENCE YEAR 1999 [b]	CY 1999	CY 2000	CY 2001	CY 2001
Plutonium Complex	1,111	463	478	526	589	589	572	635	689
Tritium Facilities	123	37	33	31	28	28	24	25	20
CMR	367	206	207	218	204	204	190	192	201
Pajarito Site	95	57	60	65	70	70	73	73	78
Sigma Complex	284	96	104	110	101	101	99	94	105
MSL	82	50	55	57	57	57	59	60	61
Target Fabrication	98	55	55	57	54	54	52	54	53
Machine Shops	289	73	77	83	81	81	80	91	92
High Explosives Testing	619	85	90	93	227	227	212	245	264
High Explosives Processing	335	184	197	201	96	96	92	107	114
LANSCE	846	494	523	547	560	560	550	505	496
Biosciences	250	78	77	82	98	98	110	116	108
Radiochemistry Laboratory	248	113	125	129	128	128	124	122	110
Waste Management – Radioactive Liquid Waste	110	47	48	55	62	62	58	47	54
Waste Management – Radioactive Solid and Chemical Waste	225	40	46	60	65	65	64	60	63
Rest of LANL	6,579	4,144	4,325	4,547	4,601	4,601	4,501	4,816	5,243
Total Employees	11,661	6,222	6,500	6,861	7,021	7,021	6,860	7,242	7,751

[a] Includes full-time and part-time regular employees; it does not include students who may be at the Laboratory for much of the year nor does it include special programs personnel. A similar index does not exist in the SWEIS, which used a very time-intensive method to calculate this index.

[b] CY 1999 was selected as the reference year for this index because it represents the year the SWEIS ROD was published.

LANL records contain the technical area and building number of each employee's office. This information does not necessarily indicate where the employee actually performs his or her work; but rather, indicates where this employee gets mail and officially reports to duty. However, for purposes of tracking the dynamics of changes in employment across Key Facilities, this information provides a useful index. Table 3.6-3 identifies UC employees by Key Facility based on the facility definitions contained in the SWEIS. The employee numbers contained in the category "Rest of LANL," were calculated by subtracting the Key Facility numbers from the calendar year total.

The numbers in Table 3.6-3 cannot be directly compared to numbers in the SWEIS. The employee numbers for Key Facilities in the SWEIS represent total workforce, and include PTLA, JCNNM, and other subcontractor personnel. The new index (shown in Table 3.6-3) is based on routinely collected information and only represents full-time and part-time regular UC employees. It does not include employees on leave of absence, students (high school, cooperative, undergraduate, or graduate), or employees from special programs (i.e., limited-term or long-term visiting staff, post-doctorate, etc.). Because the two sets of numbers do not represent the same entity, a comparison to numbers in the SWEIS is not appropriate. This new index will be used throughout the lifetime of the Yearbook; hence, future comparisons and trending will be possible. CY 1999 was selected as the reference year for this index because it represents the year the SWEIS ROD was published.

3.7 Land Resources

Land resources were examined in 1996–1998 during the development of the SWEIS. From then until CY 2002, the land resources (i.e., undeveloped and developed lands) available for use at LANL remained constant. In CY 2002, approximately 2,209 acres of land were transferred to private ownership under Public Law 105-119.

3.7.1 Land Resources—CY 1998

From 1996 through 1998, land resources at LANL and the surrounding areas remained essentially unchanged. The ROD had not been signed, and major land breaking construction projects were not undertaken. All of the construction projects that were undertaken were done within existing facilities. The SWEIS projected a habitat reduction of 41 acres under the Expanded Alternative due to the expansion of Area G. However, in 1998, LANL was still operating under the No Action Alternative, and this expansion was not undertaken. During 1998, the only major construction project outside of existing facilities at LANL was DARHT. The actual habitat loss and ground breaking activities associated with DARHT happened during construction start-up in 1992 and 1993 when the land was cleared of vegetation and the “footprint” of this facility was established.

3.7.2 Land Resources—CY 1999

In 1999, the SCC, NISC, and Los Alamos Research Park (known in 1999 as the Industrial Research Park) major construction projects started. Each of these projects had their own NEPA documentation. The SCC and NISC construction occurred on previously disturbed land containing parking lots or other structures. Only the Research Park was greenfield construction and expected to result in a loss of 30 acres. All other construction was done within existing facilities. The projected Area G expansion did not occur.

3.7.3 Land Resources—CY 2000

During 2000, land resources were impacted by the Cerro Grande Fire, which burnt across approximately 7,500 acres or 27 percent of the Laboratory’s land. Of the 332 structures affected by the fire, 236 were impacted, 68 damaged, and 28 destroyed (ruined beyond economic repair). Fire mitigation work such as flood retention facilities modified less than 50 acres of undeveloped land.

A number of projects continued to move forward, such as the SCC, the NISC, several General Plant Projects, and the related but non-Laboratory Los Alamos Research Park. Most of these projects are on previously developed or disturbed land (LANL 2000b). However, the Research Park occupies about 44 acres of previously undeveloped land along West Jemez Road.

TA-03 (left) and future site of Los Alamos Research Park (tree-covered area to the right)

The Los Alamos Research Park

Also during 2000, LANL's new Comprehensive Site Plan (CSP2000, LANL 2000d) was completed. CSP2000 is LANL's guide for land development. The CSP2000 geographic information system identified approximately 18,500 acres or two-thirds of LANL's land resources as undesirable for development due to physical and operational constraints. Of the remaining 9,300 acres (about one-third of the Laboratory's land) over 5,500 acres have been developed, leaving about 4,000 acres as undeveloped. The majority of this undeveloped land is located in TAs 58, 70, 71, and 74. Because of the remote locations and adjacent land uses of TAs 70, 71, and 74, they are not considered prime developable lands for Laboratory activities.

The ER Project is unique from a land use standpoint. Rather than using land for development, the project cleans up legacy wastes and makes land available for future use. Through these efforts, several large tracts of land will be made available for use by the Laboratory, Los Alamos County, or other adjacent landowners. For example, under Public Law 105-119, the DOE was directed to convey to Los Alamos County and transfer to the Department of Interior, in trust for the Pueblo of San Ildefonso, lands not required to meet the national security mission of DOE. Several tracts of land were identified for conveyance or transfer, and pending cleanup by the ER Project, will be made available for future use.

3.7.4 Land Resources—CY 2001

CY 2001 was similar to the previous calendar years: the land acreage remained constant; the ongoing construction projects from CY 2000 continued; and the mitigation efforts and repairs from the Cerro Grande Fire of 2000 continued.

3.7.5 Land Resources—CY 2002

CY 2002 marks the first land transfers under Public Law 105-119. LANL began CY 2002 with 27,863 acres[1] of land and ended the calendar year with approximately 25,654 acres. Table 3.7.5-1 shows that, although the land resources at LANL are distributed over 10 usage categories, all of the transferred land came from the reserve land category. Table 3.7.5-2 provides a summary of the land parcels transferred and to whom they were transferred.

Because of the land transfers, the distance to some site boundaries has decreased and a preliminary assessment of the impact of the boundary changes on the accident analyses in the SWEIS has been performed. The full assessment is in Appendix E and the conclusions of the assessment are stated below.

[1] Previously, the SWEIS Yearbooks have listed Laboratory acreage at 27,816 acres. The acreage numbers being used here are from the TYCSP (LANL 2001d). The boundary survey will determine the correct number.

Table 3.7.5-1. Site-wide Land Use

LAND USE CATEGORY	ACREAGE IN CY 2002	
	BEGINNING OF CY	END OF CY
Service/Support	140	140
Experimental Science	514	514
High Explosives Research and Development	1,310	1,310
High Explosives Testing	7,096	7,096
Nuclear Materials Research and Development	374	374
Physical/Technical Support	336	336
Public/Corporate Interface	31	31
Theoretical/Computational	2	2
Waste Management	186	186
Reserve	17,874	~15,665
Total	27,863	~25,654

Table 3.7.5-2. Land Transfers during CY 2002

DESIGNATOR	DESCRIPTION	RECIPIENT	TRANSFER DATE	ACREAGE
A-1	Manhattan Monument	Los Alamos County	October 31, 2002	0.07
A-12	LAAO-1 (East)	Los Alamos County	October 31, 2002	4.51
A-17	TA-74-1 (West)	Los Alamos County	October 31, 2002	5.52
A-19	White Rock-1	Los Alamos County	October 31, 2002	76.33
A-2	Site 22	Los Alamos County	October 31, 2002	0.17
A-3	Airport-1 (East)	Los Alamos County	October 31, 2002	9.44
A-6	Airport-4 (West)	Los Alamos County	October 31, 2002	4.18
A-9	DP Road-2 (North) (Tank Farm)	Los Alamos County	October 31, 2002	14.94
B-1	White Rock-2	Pueblo of San Ildefonso	October 31, 2002	14.94
B-2	TA-74-3 (North) (Includes B-4)	Pueblo of San Ildefonso	October 31, 2002	2,089.88
Total				2,209.29

The basic conclusion of the assessment is that the decrease in distances between assumed accident locations and previously analyzed receptor locations will have little or no impact on estimated doses in the SWEIS. On this basis there appears to be no need to revise accident analyses in the SWEIS because of land transfers from the DOE to public entities.

The conclusion is based on a review of several facilities and postulated accidents, especially risk-dominant accidents in the SWEIS. Very few or minimal changes in predicted effects are expected to occur. One exception, a hydrogen cyanide accident at the Sigma Facility, has been noted. The SWEIS still serves the purpose of characterizing LANL operations, differentiating among alternatives, and presenting a baseline that is suitable for tiering and bounding of potential accidents at LANL.

A recommendation in the conclusion is that site boundary changes be considered in future NEPA reviews as appropriate.

Tract of land identified for conveyance and transfer in Pueblo Canyon

3.8 Groundwater

Groundwater occurs in three settings beneath the Pajarito Plateau: alluvium, intermediate saturated zones, and the regional aquifer. The major source of recharge to the regional aquifer is precipitation within the Sierra de los Valles. However, alluvial groundwater on the Pajarito Plateau is a source of recharge to underlying intermediate saturated zones and to the regional aquifer.

Water levels have been measured in wells tapping the regional aquifer since the late 1940s when the first exploratory wells were drilled by the US Geological Survey (McLin et al. 1998). The annual production and use of water increased from 231 million gallons in 1947 to a peak of 1,732 million gallons in 1976. Water use has declined since 1976 to 1,286 million gallons in 1997 (McLin et al. 1997, 1998). Trends in water levels in the wells reflect a plateau-wide decline in regional aquifer water levels in response to municipal water production. The decline is gradual and does not exceed 1 to 2 feet per year for most production wells (McLin et al. 1998). When pumping stops in the production wells, the static water level returns in about 6 to 12 months. Hence, these long-term declines are not currently viewed as a threat to the water supply system (McLin et al. 1998).

Sampling and analysis of water from water supply wells indicate that water in the regional aquifer beneath the Pajarito Plateau is generally of high quality and meets or exceeds all applicable water supply standards. There have been 19 characterization wells (Figure 3-1 and Table 3.8-1) installed in the regional aquifer over the past four years and each of the wells has been sampled on a quarterly basis. Data such as these are

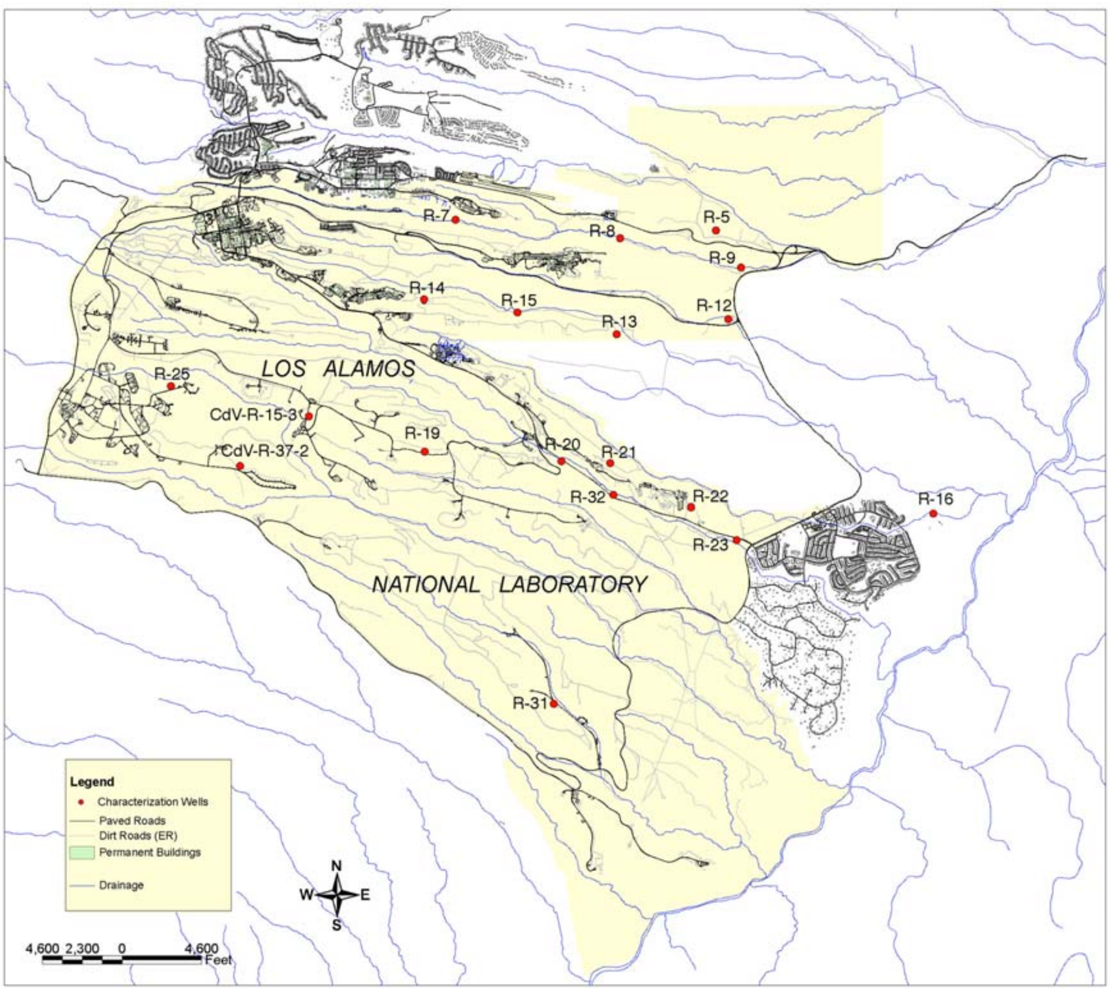


Figure 3-1. Location of the groundwater characterization wells.

Table 3.8-1. Groundwater Characterization Wells

WELL	LOCATION	DATE DRILLED	TOTAL DEPTH (FEET)	PURPOSE/FINDINGS
R-5	Pueblo Canyon	May 2001	902	Investigate regional aquifer, intermediate perched groundwater zones, and intercalated unsaturated zones in the northeast part of LANL. No contaminants in regional aquifer.
R-7	Los Alamos Canyon	January 2001	1,097	Investigate regional aquifer, intermediate perched groundwater zones, and intercalated unsaturated zones in the north-central part of LANL. No contaminants in regional aquifer.
R-8	Los Alamos Canyon	January 2002	860	Determine regional aquifer quality down gradient of releases in Los Alamos and DP Canyons. Tritium in regional aquifer indicating a component of water less than 60 years old.
R-9, R-9i	Los Alamos Canyon	September 1999	771	Determine regional aquifer quality at the Laboratory boundary down gradient of releases in Los Alamos and DP Canyons. Tritium in perched zones and regional aquifers indicating a component of water less than 60 years old.
R-12	Sandia Canyon	January 2000	886	Determine regional aquifer quality at the Laboratory boundary down gradient of releases in Sandia Canyon. Tritium in perched zones and regional aquifers indicating a component of water less than 60 years old.
R-13	Mortandad Canyon	October 2001	1,133	Examine water quality at the Laboratory boundary down gradient of releases within the Mortandad Canyon. No contaminants detected in the regional aquifer.
R-14	Ten Site Canyon	July 2002	1,325	Examine water quality near the discharge point for the RLWTF (TA-50). No contaminants detected in the regional aquifer.
R-15	Mortandad Canyon	September 1999	1,107	Examine water quality down-gradient from the discharge point for the RLWTF (TA-50). Contaminants detected in the regional aquifer are tritium, nitrate, and perchlorate. None are above drinking water standards.
R-16	Cañada del Buey	August 2002	1,287	Measure water levels and vertical gradients in regional aquifer in the discharge area. No contaminants detected in regional aquifer.
R-19	Mesa south of Three-Mile Canyon	March 2000	1,903	Determine regional aquifer quality at the Laboratory boundary down gradient of potential releases in upper Pajarito Canyon. No contaminants detected in perched or regional aquifer.
R-20	Pajarito Canyon	August 2002	1,365	Sentry well for water supply well PM-2. Regional aquifer water quality upgradient of TA-54. No contaminants detected in the regional aquifer.
R-21	Cañada del Buey	November 2002	995	Evaluate and monitor hydrologic and geochemical conditions near MDA-L. No contaminants detected in the regional aquifer.
R-22	Mesita del Buey above Pajarito Canyon	October 2000	1,489	Regional water quality and water level down gradient of TA-54. Tritium in regional aquifer indicating a component of water less than 60 years old.

Table 3.8-1. Groundwater Characterization Wells (continued)

WELL	LOCATION	DATE DRILLED	TOTAL DEPTH (FEET)	PURPOSE/FINDINGS
R-23	Pajarito Canyon	September 2002	930	Regional water quality and water level near TA-54. No contaminants detected in the regional aquifer.
R-25	Mesa south of Cañon de Valle	February 1999	1,942	Regional water quality and water level near MDA-P and other potential release sites in TA-16. High explosives and solvents in upper saturated zone and regional aquifer. Tritium in upper saturated zone and regional aquifer indicating a component of water less than 60 years old.
R-31	Ancho Canyon	February 2000	1,103	Regional water quality and water level near burning/open detonation sites. No contaminants detected in the regional aquifer.
R-32	Pajarito Canyon	August 2002	1,008	Regional water quality and water level near TA-54. No contaminants detected in the regional aquifer.
CdV-R-15-3	Cañon de Valle	April 2000	1,722	Determine extent of high explosives in perched zones down gradient of TA-16. No contaminants detected in the perched or regional aquifers.
CdV-R-37-2	Mesa north of Water Canyon	August 2001	1,664	Determine extent of high explosives in perched zones down gradient of TA-16. No contaminants detected in the regional aquifer.

captured in the Laboratory's annual groundwater status report. The most recent status report covers FY 2002 (Nylander et al. 2003).

Highlights of the regional aquifer water chemistry from these characterization wells are as follows:

- Natural groundwater ranges from calcium-sodium bicarbonate composition (Sierra de los Valles) to sodium-calcium bicarbonate composition (White Rock Canyon springs) (Longmire 2002a, b; Blake et al. 1995; LANL 2001). Silica is the second most abundant solute found in surface water and groundwater because of reactions between soluble silica glass in the rock and water. Trace metals, including barium, strontium, and uranium, vary within the different saturated zones (alluvial, intermediate, and regional aquifer) depending on how long the water has been in contact with the host rock (Nylander et al., 2003). Older groundwater within the regional aquifer tends to have higher concentrations of trace elements.
- Dissolved organic carbon, in the form of humic and fulvic acids, is present in groundwater in concentrations typically less than 3 milligrams carbon per liter. These acids occur as anions and can complex with calcium and magnesium. Higher concentrations of dissolved organic carbon occur in alluvial groundwater where runoff through grasslands and forests takes place. Shortly after the Cerro Grande Fire, increased concentrations of total organic carbon were observed in surface water and alluvial groundwater within Pueblo Canyon, Los Alamos Canyon, Pajarito Canyon, and other watersheds. Since 2002, concentrations of total organic carbon have decreased in surface water, but remain elevated in alluvial and perched-intermediate groundwater. Total organic carbon provides an excellent tracer for tracking movement of recent water (post Cerro Grande Fire) in the subsurface.
- Groundwater impacted by LANL-derived effluent is characterized by elevated concentrations of major ions (calcium, magnesium, potassium, sodium, chloride, bicarbonate, nitrate, and sulfate); trace solutes (for example, molybdenum, perchlorate, barium, boron, and uranium); high explosive compounds and other volatile organic compounds; and radionuclides (tritium, americium-241, cesium-137, plutonium isotopes, strontium-90, and uranium isotopes) (Longmire 2002a, b, c, d; LANL 2001c).
- With regard to interconnection between alluvial groundwater, intermediate saturated zones, and the regional aquifer, contaminant source terms correlate reasonably well with chemical data for mobile solutes collected at down gradient characterization wells (Longmire 2002a, LANL 2001c). Non-adsorbing contaminants (perchlorate, nitrate, RDX, and TNT) are the most mobile and travel the greatest distances along groundwater-flow paths**.** Concentrations of some of these chemicals in groundwater have been observed above established maximum contaminant levels and recommended health and action levels in wells (LANL 2001c, Broxton et al. 2002):

    - MCOBT-4.4: intermediate saturated zone, nitrate, perchlorate
    - R-25: intermediate saturated zone, high explosives (RDX)
    - Alluvial wells: alluvial aquifer, actinides, metals, and fission products (Los Alamos Canyon, Pueblo Canyon, and Mortandad Canyon)


Drilling auger and crew

Cleaning the drilling residues from a regional aquifer well

Perchlorate and RDX are persistent chemicals, which are resistant to reductive breakdown to non-toxic forms in the environment.

Work underway as part of the Hydrogeologic Characterization Program, and described in the Hydrogeologic Workplan (Barr 2001), provided new information on the regional aquifer and details of the hydrogeologic conditions. By the end of 2002, six additional characterization wells were complete. The characterization wells were drilled using air rotary in the vadose zone and rotary with stiff foam or bentonite mud in the saturated zone. Casing advance with fluid assist methods, used in drilling previous characterization wells, was employed only when swelling clays were encountered in the boreholes. Geologic core was collected in the upper vadose zone in each well, and geologic cuttings were collected at defined intervals during the drilling operations and described to record the stratigraphy encountered. Geophysical logging was conducted in each well to enhance the understanding of the stratigraphy and rock characteristics. The six completed characterization wells include R-8 (Los Alamos Canyon); R-20, R-23, and R-32 (Pajarito Canyon); R-16 near the Rio Grande in White Rock; and R-13 (Mortandad Canyon). R-21 in Cañada del Buey near TA-54 was started early in FY 2003. Table 3.8-1 summarizes details on the 19 characterization wells completed by the Laboratory.

R-8 is located in Los Alamos Canyon near the confluence of Los Alamos Canyon and DP Canyon. The primary purpose of the well is to determine regional aquifer water quality down-gradient of releases in Los Alamos and DP Canyons. It also serves as a sentry well for PM-2. Significant difficulties were encountered in drilling the R-8 bore hole, so the well was constructed in a second bore hole drilled 62 ft due east of the original location. Drilling of the R-8 bore hole took place between January 9 and January 27, 2002. Well construction and development were completed on February 14, 2002. Westbay sampling equipment was installed between February 21 and February 24, 2002. The R-8 well is completed with two screened intervals in the regional aquifer: one straddling the water table at a depth of 705 to 755 feet and one at a depth of 821 to

828 ft. One sample of water from the bore hole was collected from a depth of 822 ft. Tritium with activity of 15 picocuries per liter was detected in the bore hole water sample.

Well R-14 is located within the Mortandad Canyon watershed in Ten Site Canyon, east of the former radioactive liquid waste and septic treatment facilities at TA-35. Drilling started on June 2, 2002, and was completed on July 2, 2002. The regional aquifer water level is at 1,180 feet in the high-gamma Puye Formation. Well construction and development were conducted and Westbay sampling equipment was installed to complete the well with two screened intervals in the regional aquifer: one near the water table at a depth of 1,200 feet and one in a productive zone at a depth of 1,286 feet.

R-16 is located above the Rio Grande in Overlook Park in the town of White Rock. Drilling started on August 16, 2002, and was completed on September 13, 2002. Based on the 3-D geologic model, the static water level for the regional aquifer was anticipated to be at 783 feet. There was indication of water influx at 867 feet, drilling was stopped and the water level was measured. The water level rose to 621 feet, much higher than expected. There were clay-rich zones in the Santa Fe Group, so one possible explanation for the rise in water level is that the clay zones act as confining zones. Similar artesian conditions were also encountered in Los Alamos Canyon (R-9). Well construction, development, and installation of Westbay sampling equipment completed the well with three screened intervals in the regional aquifer:

- Screen 1: 863–871 feet
- Screen 2: 1,015–1,022 feet
- Screen 3: 1,237–1,244 feet

R-20 is located in Pajarito Canyon, east of TA-18 on the south side of Pajarito Road. Drilling started on August 4, 2002, and was completed on September 19, 2002. No perched water was encountered in R-20. The static water level in the regional aquifer is at 872 feet. The well was constructed with three screened intervals, the deeper screens were put in to coincide with screened interval in PM-2:

- Screen 1: 904–912 feet
- Screen 2: 1,147–1,154 feet
- Screen 3: 1,328–1,336 feet

Well R-23 was drilled in Pajarito Canyon, just west of the NM 4/Pajarito Road intersection, on the south side of Pajarito Road. Drilling started on August 17, 2002, and was completed on October 3, 2002. The regional water table in R-23 was encountered at 817 feet, higher than predicted by the 3-D geologic model (892 feet). Based on geophysical logging, perched water may be present. The well was constructed with one screened interval, from 816 to 873 feet, at the top of the regional aquifer water table.

Well R-32 is located in Pajarito Canyon, south of TA-54, on the north side of Pajarito Road. Drilling started on July 13, 2002, and was completed on August 7, 2002. The regional water table in R-32 was originally encountered at 865 feet, the depth predicted by the 3-D Geologic Model. However, the water level rose to 715 feet. The well was constructed with three screened intervals, one at the top of water table and two deeper to measure pressure gradients:

- Screen 1: 867–874 feet
- Screen 2: 930–933 feet
- Screen 3: 970–977 feet

3.9 Cultural Resources

LANL has a large and diverse number of historic properties. Approximately 85 percent of DOE land in Los Alamos County has been surveyed for prehistoric and historic cultural resources. Over 1,800 prehistoric sites have been recorded (Table 3.9-1). More than 85 percent of these archeological sites date from the 14th and 15th centuries. Most of the sites are found in the piñon-juniper vegetation zone, with 80 percent lying between 5,800 and 7,100 feet in elevation. Almost three-quarters of all sites are found on mesa tops.

Table 3.9-1. Acreage Surveyed, Prehistoric Cultural Resource Sites Recorded, and Cultural Resource Sites Eligible for the National Register of Historic Places at LANL FY 2002[a]

FISCAL YEAR	TOTAL ACREAGE SURVEYED	TOTAL ACREAGE SYSTEMATICALLY SURVEYED TO DATE	TOTAL PREHISTORIC CULTURAL RESOURCE SITES RECORDED TO DATE[b] (CUMULATIVE)	TOTAL NUMBER OF ELIGIBLE AND POTENTIALLY ELIGIBLE NRHP SITES	NUMBER OF NOTIFICATIONS TO INDIAN TRIBES[c]
LANL SWEIS ROD	Not reported	Not Reported	1,295[d]	1,092	23
1998	1,920	17,937	1,369	1,304	10
1999	1,074	19,011	1,392	1,321	13
2000	119	19,428	1,459	1,386	6
2001	4,112	19,790	1,424[d]	1,297[d]	2
2002	2,686	22,476	1,835	1,699	6

[a] Source: The Secretary of Interior's Report to Congress on Federal Archaeological Activities. Information on LANL provided by DOE/Los Alamos Site Office and LANL Cultural Resources Management Team (CRMT).

[b] In the 1999 and 2000 Yearbooks, this column, then titled 'Total Archaeological Sites Recorded to Date,' included Historic Period cultural resources (A.D. 1600 to present), including buildings. In order to conform to the way cultural properties were discussed in the SWEIS, historic period properties were removed beginning with the 2001 SWEIS Yearbook. Historic sites are now documented in a separate table (3.9-2).

[c] As part of the SWEIS preparation, 23 tribes were consulted in a single notification. Subsequent years, however, show the number of separate projects for which tribal notifications were issued; the number of tribes notified is not indicated.

[d] As part of ongoing work to field verify sites recorded 20 to 25 years ago, LANL's CRMT has identified sites that have been recorded more than once and have multiple Laboratory of Anthropology (LA) site numbers. Therefore, the total number of recorded archaeological sites is less than indicated in FY 2000. This effort will continue over the next several years and more sites with duplicate records will probably be identified.

LANL continues to evaluate buildings and structures from the Manhattan Project and the early Cold War period (1943–1963) for eligibility to the Natural Register of Historic Places (NRHP). Within LANL's limited access boundaries, there are ancestral villages, shrines, petroglyphs, sacred springs, trails, and traditional use areas that could be identified by Pueblo and Athabascan communities as traditional cultural properties.

The SWEIS ROD lists 2,319 historic (A.D. 1600 to the present) cultural resource sites, including sites dating from the Historic Pueblo, US Territorial, Statehood, Homestead, Manhattan Project, and Cold War Periods (Table 3.9-2). To date LANL has identified no sites associated with the Spanish Colonial or Mexican Periods. Many of the 2,319 potential historic cultural resources are temporary and modular properties, sheds, and utility features associated with the Manhattan Project and Cold War Periods. Since the SWEIS ROD was issued, these types of properties have been removed from the count of historic properties because they are exempt from review under the terms of the Programmatic Agreement (MOU DE-GM32-00AL77152) between the DOE Los Alamos Area Office, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation. Additionally, the CRMT has evaluated many Manhattan Project and Early Cold War properties (A.D. 1942–1963) and those properties built after 1963 that potentially have historical

Table 3.9-2. Historic Period Cultural Resource Properties at LANL[a]

FISCAL YEAR	POTENTIAL PROPERTIES[b]	PROPERTIES RECORDED[c]	ELIGIBLE AND POTENTIALLY ELIGIBLE PROPERTIES	NON-ELIGIBLE PROPERTIES	EVALUATED BUILDINGS DEMOLISHED
LANL SWEIS ROD	2,319	164	98	Not Reported	Not Reported
1998	Not Reported	181	136	45	Not Reported
1999	Not Reported	240	170	70	Not Reported
2000	Not Reported	246	173	73	Not Reported
2001	733	259	186	73	33
2002	753	301	218	83	42

[a] Source: The Secretary of Interior's Report to Congress on Federal Archaeological Activities. Information on LANL provided by DOE/Los Alamos Site Office and LANL CRMT. Numbers given represent cumulative total properties identified, evaluated, or demolished by the end of the given fiscal year.

[b] This number includes historic sites that have not been evaluated, and therefore, may be potentially NRHP-eligible. In addition, beginning with the 2002 Yearbook, historic properties that are exempt from review under the terms of the Programmatic Agreement were removed from these totals, substantially reducing the number of potential historic period cultural resources.

[c] This represents both eligible and non-eligible sites.

significance, reducing the total number of potential historic cultural resource sites to 753. Most buildings built after 1963 are being evaluated on a case-by-case basis as projects arise that have the potential to impact the properties. Therefore, additional buildings may be added to the list of historic properties in the future.

LANL has recorded 139 historic sites. All have been given unique New Mexico LA site numbers. Some of the 139 are experimental areas and artifact scatters dating from the Manhattan Project and early Cold War Periods. The majority, 126 sites, are structures or artifact scatters associated with the Historic Pueblo, US Territorial, Statehood, or Homestead Periods. Of these 139 sites 96 have been declared eligible for the NRHP. LANL's Manhattan Project and early Cold War Period buildings account for the remaining 614 of the 753 historic period properties. At this time the New Mexico State Historic Preservation Division (NMSHPD) does not assign LA numbers to LANL buildings. Of these historic buildings, 162 have been evaluated for eligibility and inclusion on the NRHP. Forty of these evaluated buildings have been declared not eligible for the NRHP; the remaining 122 are NRHP-eligible.

The CRMT has documented 30 of the NRHP-eligible buildings in accordance with the terms of official Memorandums of Agreement between the DOE and the NMSHPD. They have subsequently been decontaminated, decommissioned, and demolished through the Decontamination and Decommissioning Program. Twelve of the 40 non-eligible buildings have also been demolished through this program.

3.9.1 Compliance Overview

Section 106 of the National Historic Preservation Act, Public Law 89-665, implemented by 36 Code of Federal Regulations Part 800 (36 CFR 800), requires Federal agencies to evaluate the impact of proposed actions on historic properties. Federal agencies must also consult with the State Historic Preservation Officer and/or the Advisory Council on Historic Preservation about possible adverse effects to NRHP-eligible resources.

During FY 2002 (October 2001 through September 2002), the CRMT evaluated 1,124 Laboratory proposed actions and conducted two new field surveys to identify cultural resources. DOE sent 11 survey results to the SHPO for concurrence in findings of effects and determinations of eligibility for the NRHP of cultural resources located during the survey.

The American Indian Religious Freedom Act of 1978 (Public Law 95-341) stipulates that it is Federal policy to protect and preserve the right of American Indians to practice their traditional religions. Tribal groups must receive notification of possible alteration of traditional and sacred places. The Governors of San Ildefonso, Santa Clara, Cochiti, and Jemez Pueblos and the President of the Mescalero Apache Tribe received copies of six reports to identify any traditional cultural properties that a proposed action could affect. CRMT identified adverse effects to three historic buildings that were decommissioned and decontaminated in 2002. Historic building documentation and interpretation were conducted to resolve the adverse effects.

The Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601) states that if burials or cultural objects are inadvertently disturbed by Federal activities, work must stop in that location for 30 days, and the closest lineal descendant must be consulted for disposition of the remains. No discoveries of burials or cultural objects occurred in FY 2002. The Archaeological Resources Protection Act of 1979 (Public Law 96-95) provides protection of cultural resources and sets penalties for their damage or removal from Federal land without a permit. No violations of this Act were recorded on DOE land in FY 2002.

3.9.2 Compliance Activities

Nake'muu. During FY 2002, as part of the DARHT MAP (LANL 1995), the CRMT continued a long-term monitoring program at the ancestral pueblo of Nake'muu to assess the impact of LANL mission activities on cultural resources. Nake'muu is the only pueblo at the Laboratory that still contains its original standing walls. It dates from circa A.D. 1200 to 1325 and contains 55 rooms with walls standing up to six feet high. FY 2002 witnessed the lowest loss rate for chinking stones (0.5%) and masonry blocks (0.2%) during the five-year monitoring period. The fact that this was an extreme drought year would support the contention that natural processes have a great effect on the deterioration rate of the site. During the five-year monitoring program Nake'muu has experienced a 5.8 percent loss of chinking stones and 2.7 percent loss of masonry blocks. During FY 2002 the post-Cerro Grande Fire Pueblo Site Condition Assessment Team also visited Nake'muu. Trees that could potentially fall and damage the standing wall architecture were marked for future removal during 2003.

Members of the San Ildefonso Pueblo visiting the Nake' muu ruins

Traditional Cultural Properties Comprehensive Plan. During FY 2002, the CRMT continued to assist DOE in implementing the Traditional Cultural Properties Comprehensive Plan (LANL 2000e). This included a formal meeting with the four Accord Pueblos (Cochiti, Jemez, San Ildefonso, Santa Clara) and a separate formal meeting with the Hopi Tribe. In addition, two individual working meetings were held with representatives from San Ildefonso Pueblo. A plan has been developed with San Ildefonso Pueblo to prioritize their issues, beginning with consideration of TA-03 and previously identified traditional cultural properties in Rendija Canyon.

Shards found on the Pajarito Plateau

Land Conveyance and Transfer. *The Programmatic Agreement Among the United States Department of Energy, the Advisory Council on Historic Preservation, the New Mexico State Historic Preservation Officer, and the Incorporated County of Los Alamos, New Mexico, Concerning the Conveyance of Certain Parcels of Land to Los Alamos County, New Mexico* was signed in May 2002 (DOE 2002b). In September 2002, the TA-74 North tract was transferred to the Pueblo of San Ildefonso. Excavations at the Airport East and White Rock tracts began in June 2002 and were completed in March 2003. Those tracts are now available to the County of Los Alamos for development. In the 2003 archeological field season, the Airport Central tract is scheduled for excavation and historic building documentation will be completed at the DOE/NNSA Los Alamos Site Office building, the Laboratory Archives, and the classified incinerator.

Cerro Grande Fire Recovery. During 2002, the CRMT finished its archaeological assessment of more than 500 sites and historic buildings and structures that were potentially impacted by the May 2000 Cerro Grande Fire. The report of this assessment will be made available to the general public through the Ecology Group and LANL's Library Without Walls web sites. The CRMT also continued to assist the Cerro Grande Rehabilitation Project in support of a contract with the Pueblos of San Ildefonso and Santa Clara to provide specific recommendations for rehabilitative treatments at approximately 118 archaeological sites most heavily impacted by the fire. The Cerro Grande Rehabilitation Project and the Pueblo of San Ildefonso will implement these treatments during 2003.

3.9.3 Integrated Cultural Resources Management Plan

The Integrated Cultural Resources Management Plan will provide a set of guidelines for managing and protecting cultural resources, in accordance with requirements of the National Historic Preservation Act, the Archaeological Resources Protection Act, and the American Indian Religious Freedom Act and in the context of UC/LANL's mission.

The *Comprehensive Plan for Consideration of Traditional Cultural Properties and Sacred Sites at Los Alamos National Laboratory, New Mexico* (LANL 2000e), issued August 2000, presents a framework for collaborating with Native American Tribal organizations and other ethnic groups in identifying traditional cultural properties and sacred sites. The ICRMP will provide high-level guidance for implementation of this Comprehensive Plan.

Status:
The Integrated Cultural Resources Management Plan is due to be complete in 2004 and it will be updated every five years after issuance.

Relationship to Other Plans:
The Biological Resources Management Plan (particularly the Threatened and Endangered Species Habitat Management Plan [LANL 1998]) may limit access to certain cultural resource sites. Erosion control under the water plans will have a potential impact on cultural resource sites.

Demolished Buildings

Table 3.9.3-1 indicates the extent of historic building documentation and demolition to date.

Table 3.9.3-1. Historic Building Documentation and Demolition Numbers

FISCAL YEAR	NUMBER OF BUILDINGS FOR WHICH REQUIRED DOCUMENTATION WAS COMPLETED	NUMBER OF BUILDINGS ACTUALLY DEMOLISHED IN FISCAL YEAR[a]
Pre 1995	1	Unknown
1995	21	Unknown
1996	0	Unknown
1997	0	Unknown
1998	5	Unknown
1999	5	Unknown
2000	0	Unknown
2001	7	Unknown
2002	31	0
TOTAL	42	42

[a] Although buildings were demolished in the years before 2002, the CRMT did not monitor the dates when the building demolitions actually occurred, but the total is 42.

2002 Land Transferred

Nine cultural resources sites were excavated in whole or in part in the White Rock and Airport tracts. Sites transferred to San Ildefonso Pueblo did not require data recovery since the cultural properties are protected by the same Federal laws that apply to DOE.

White Rock Tract. A total of 11 sites were transferred to San Ildefonso Pueblo and Los Alamos County. Eight of these sites had data recovery including all seven County sites and the County portion of a site straddling the boundary between the County and San Ildefonso Pueblo.

Airport Tract. One site was excavated and transferred to Los Alamos County.

TA-74 Tract. Forty-nine sites were transferred to San Ildefonso Pueblo.

3.10 Ecological Resources

LANL is located in a region of diverse landform, elevation, and climate—features that contribute to producing diversified plant and animal communities. Plant communities range from urban and suburban areas to grasslands, wetlands, shrub lands, woodlands, and mountain forest. These plant communities provide habitat for a variety of animal life.

The SWEIS ROD projected no significant adverse impacts to biological resources, ecological processes, or biodiversity (including threatened and endangered species). Data collected for 2001 support this projection. These data will be reported in the 2001 Environmental Surveillance Report (LANL 2002b).

Probably the greatest natural resources management issue for LANL in 2002 was the continuing recovery and response to the Cerro Grande Fire of May 2000. The wildfire fuels reduction program has treated several thousand acres of forest and woodland and will continue to operate through 2003. Burned area rehabilitation and monitoring efforts are ongoing. Vegetation and wildlife monitoring efforts are evaluating the effects of the fire and the thinning activities. LANL personnel are developing a biological resources management plan that will define management objectives and actions for sustainable stewardship of our natural resources.

3.10.1 Threatened and Endangered Species Habitat Management Plan

LANL's Threatened and Endangered Species Habitat Management Plan (LANL 1998) received US Fish and Wildlife Service concurrence on February 12, 1999. The plan is used in project reviews and to provide guidelines to project managers for assessing and reducing potential impacts to federally listed threatened and endangered species, including the Mexican spotted owl, southwestern willow flycatcher, and bald eagle. The Threatened and Endangered Species Habitat Management Plan was incorporated into the NEPA, Cultural, and Biological Laboratory Implementation Requirement (LIR) document developed during 1999. The LIR program provides training to LANL personnel on the proper implementation of the Threatened and Endangered Species Habitat Management Plan as part of a LIR training program.

In 2002, LANL continued to assess the effects of the Cerro Grande Fire on threatened or endangered species. As reported in the 2001 Yearbook (LANL 2002a), there is no evidence that the fire caused a long-term change to the overall number of federally listed threatened or endangered species inhabiting the region. LANL's species of greatest concern, the Mexican spotted owl, resumed normal breeding activities in 2001 and 2002. Some State-listed species, including the Jemez Mountains salamander, have undoubtedly been less fortunate.

LANL continues to operate under the original Threatened and Endangered Species Habitat Management Plan guidelines. Work is continuing on a habitat model of Mexican spotted owls in the Jemez Mountains. A recently completed post-fire land cover map will provide more current information on habitat types. The results of these projects will refine the model of Mexican spotted owl habitat requirements and will be used to modify the Threatened and Endangered Species Habitat Management Plan and to reflect post-fire habitat changes.

LANL expanded the migratory bird monitoring program in 2002. The expanded monitoring program will provide better data on the distribution and abundance of migratory species on LANL property. It will also allow LANL staff to better manage these habitats and to meet obligations under the Migratory Bird Treaty Act (16 USC 703-711).

In late 2002, bark beetle infestations killed large numbers of ponderosa pine and piñon pine throughout the Southwest, including LANL property. In some stands, over 90 percent of the pines have died. At this time the ecological consequences of this event can only be postulated, but with the enhanced monitoring capability, LANL staff will be better able to evaluate effects on sensitive species in subsequent years.

In 2002, the LANL staff continued several contaminant studies and risk assessment studies of threatened and endangered species inhabiting Laboratory lands. These studies include potential impacts from the Cerro Grande Fire and involve assessing organic chemical contamination in the food chain for selected endangered species and monitoring polychlorinated biphenyls and organochlorine pesticides in fish of the Rio Grande.

3.10.2 Biological Assessments

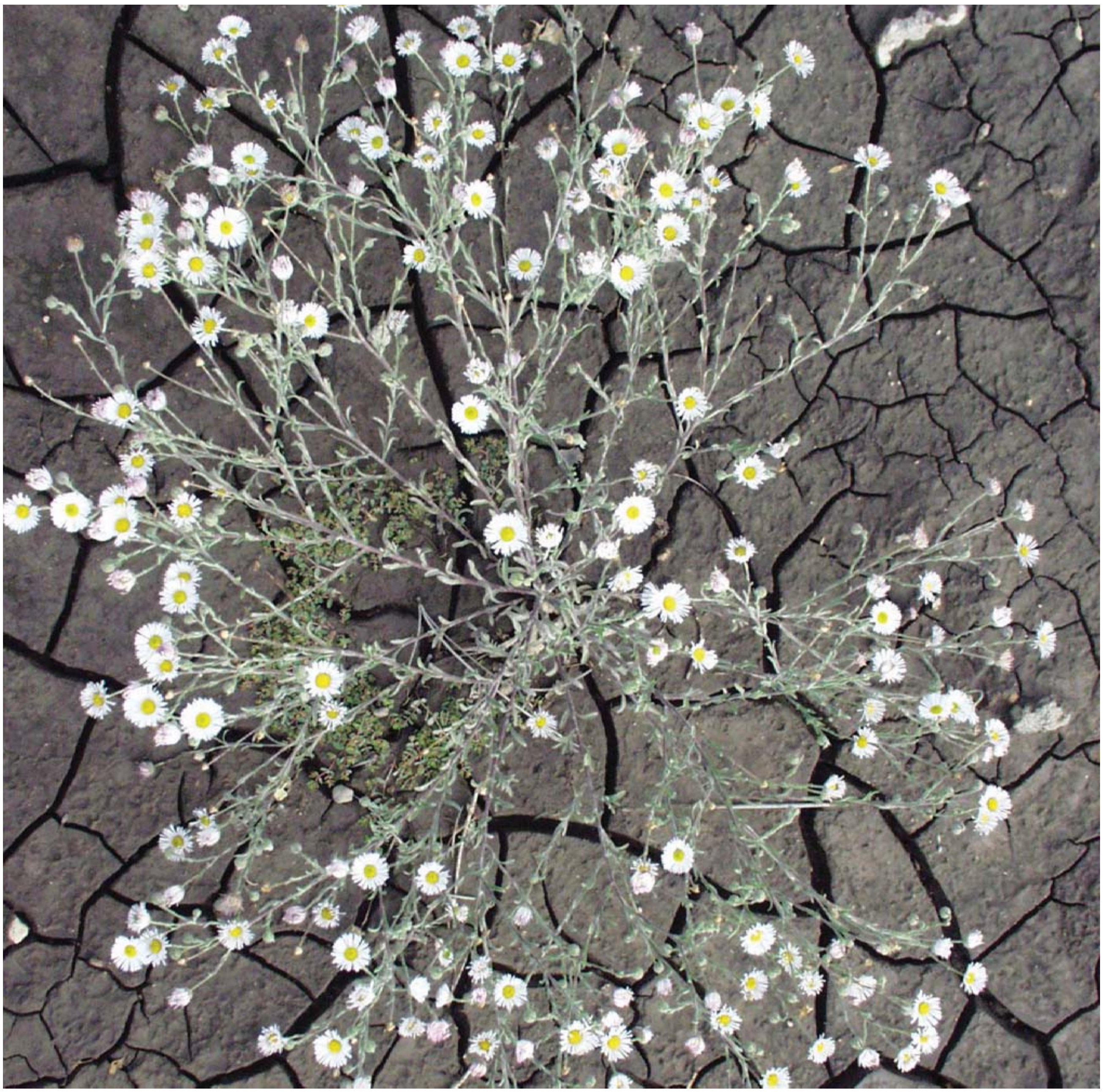
The Laboratory reviews proposed activities and projects for potential impact on biological resources including Federal- or State-listed threatened or endangered species. These reviews evaluate and record the amount of development or disturbance at proposed construction sites, the amount of disturbance within designated core and buffer habitat, the potential impact to wetlands or floodplains in the project area, and whether habitat evaluations or species-specific surveys are needed (Table 3.10.2-1).

Table 3.10.2-1. Biological Resources Reviews

TIME FRAME	TOTAL PROJECT REVIEWS	NUMBER OF HABITAT SURVEYS REQUIRED	NUMBER OF PROJECTS MODIFIED TO MEET HMP [a] GUIDELINES	UNDEVELOPED BUFFER AREAS AFFECTED (ACRES)	UNDEVELOPED CORE HABITAT AFFECTED (ACRES)
10/01/1999 – 12/31/2000	~505	60	45	12	3.6
01/01/2001 – 12/31/2002	~2,000	475	260	63	5.7

[a] HMP = LANL's Threatened and Endangered Species Habitat Management Plan (LANL 1998).

During 2002, LANL completed three biological compliance packages for projects requiring an Endangered Species Act biological assessment (BA). The compliance package includes the BA, a wetlands and floodplains assessment, a migratory birds assessment, and an assessment of state-listed species of interest. Compliance packages were written in support of the original Security Bypass Road Project (LANL 2002c; subsequently replaced by the Access Control and Traffic Improvement Project), the Los Alamos Canyon Gas Line Project (LANL 2002d), and the Pajarito Gas Line Project (LANL 2001e). The US Fish and Wildlife Service concurred in determinations that all four projects may affect, but are not likely to adversely affect, the Mexican spotted owl and the bald eagle and will have no effect on other threatened or endangered species. In addition to the compliance packages, LANL produced four independent floodplains/wetlands assessments: for the TA 18-22 Bypass Road Project, the Disposition of the Cerro Grande Fire Flood and Sediment Retention Structure Project, the installation of a multiple permeable reactive barrier in Mortandad Canyon, and the Access Control and Traffic Improvement Project.



Fleabane Daisy

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Wetland in Mortandad Canyon

4.0 Trend Analysis

Beginning in 1999 the Yearbook included a new chapter that examined trends by comparing actual LANL operating conditions to SWEIS ROD projections. Where the 1999 Yearbook was restricted to waste data, subsequent Yearbooks also included land use and utilities information. Additional information has been added in this edition of the Yearbook so that SWEIS ROD projections can be applied to a wider range of data. Many of these comparisons are qualitative due to the nature of the data collected. The purpose of these additional comparisons is to allow a more comprehensive review of the SWEIS projections compared to actual LANL operating parameters over the years in which data were available, usually about five years.

In preparing this chapter, it became obvious that not all data collected lend themselves to this type of analysis. First, some data consist mostly of estimates (i.e., historical NPDES outfall flows) where variations between years may be nothing more than an artifact of the methodology used to make estimates. These data did not depict environmental risk, and any evaluation between years would be meaningless. Second, some data were so far below SWEIS ROD projections (i.e., air quality and high explosive production), that even significant increases in measured quantities would not cause LANL to exceed the risks evaluated in the SWEIS, and such a comparison would have served no practical purpose for the development of a SWEIS in the future. Finally, some data did not represent site impacts, were inherently variable, and did not represent utilization of onsite natural resources (i.e., ER Project exhumed material shipped offsite).

The data conducive to numerical analysis represent real numbers of two distinct types. First, data that demonstrate cumulative effects across years where summed quantities could approach or exceed SWEIS ROD projections or regulatory limits or create negative environmental impacts (e.g., waste disposed at LANL). Or, second, data that represent, on an annual basis, measured quantities that approach limits established by agreement and/or regulation (i.e., gas, electric, and water consumption). Specific factors that influenced the numerical values are found in previous Yearbooks and in Chapter 3 of this Yearbook. Where quantitative comparisons are not appropriate, this chapter attempts to summarize the relationship of LANL's operations to the SWEIS projections qualitatively.

4.1 Air Emissions

Air emissions continue to be within regulatory limits. LANL continues to be in compliance with air quality standards and the region continues to be an attainment area for air quality under the Clean Air Act.

4.1.1 Radioactive Air Emissions

The SWEIS projected annual radioactive stack emissions for LANL at 21,700 curies per year. Since 1998 LANL's radioactive stack emissions have not exceeded 15,400 curies in a single year (see Table 3.1.1-1). LANSCE, the largest contributor to LANL radioactive stack emissions, has consistently emitted fewer curies of radioactive material than was projected by the SWEIS. Consequently LANL is still operating within the parameters that the SWEIS analyzed (Figure 4-1). This is likely due to the conservative nature of the SWEIS projections and to a lower level of operations than was considered in the SWEIS.

Tritium emissions are the largest contributor to LANL's overall radioactive emissions (see Table 3.1.1-1). Tritium emissions from Key Facilities have, with one exception (2001), also been within the projections of the SWEIS. The single exception was a one-time release of 7,600 curies. The effect of this single release has been to raise the average annual emissions of tritium to about 25 percent above the SWEIS projections. If this single event is deducted from the tritium emissions for 2001, tritium emissions from Key Facilities are less than half what the SWEIS projected (Figure 4-2). The SWEIS parameter for tritium emissions from the Non-Key Facilities is 910 curies per year based on the index year of 1994 (SWEIS Table 3.6.1-31). The average annual emissions of tritium from Non-Key Facilities has exceeded that value slightly in three of the four years for which data were reported; however, the average annual tritium emissions from Non-Key Facilities is below the SWEIS parameter.

The SWEIS projected the maximum offsite dose to a member of the public at 5.44 millirem per year. In the period from 1998 to 2002, the actual dose has been lower than projected (see Table 3.1.1-2) and has not approached the EPA dose standard of 10 millirem per year (Figure 4-3).

4.1.2 Nonradioactive Air Emissions

The Los Alamos area continues to be an attainment area for criteria air pollutants under the Clean Air Act. With few exceptions, annual emissions of criteria air pollutants from LANL operations from 1998 to 2002 remained within SWEIS projections for all four categories (carbon monoxide [Figure 4-4], NO_x [Figure 4-5], particulate matter [Figure 4-6], and SO_x [Figure 4-7]) (see Table 3.1.2.1-1). During the Cerro Grande Fire in 2000, the steam plant burned fuel oil, significantly increasing the emissions of SO_x. This event is not typical of LANL operations. In 2002, the use of air curtain destructors to dispose of trees thinned as part of the Cerro Grande Rehabilitation Project resulted in higher than projected quantities of particulates and SO_x. Emissions of these two pollutants will remain higher than SWEIS projections while extensive tree thinning continues in 2003. At the conclusion of the large-scale tree thinning, the emissions levels should drop to levels more in line with SWEIS projections. Nitrogen oxide emissions have decreased during CY 2002 due to the installation of flue gas recirculation equipment and to the transfer of the water pump to Los Alamos County. However, it is expected that there will an increase in NO_x emissions in 2004 or 2005 when the TA-03 Power Plant begins operation of the new combustion turbine generator.

Since the SWEIS reported chemical emissions (volatile organic compounds and hazardous air pollutants) as concentrations, the data cannot be directly compared to data reported in the Yearbook. Total emissions of volatile organic compounds and hazardous air pollutants (see Table 3.1.2.2-1) show considerable variation over the last four years (Figure 4-8). Use of the air curtain destructors accounted for substantial increases in both volatile organic compounds and hazardous air pollutants in 2002. As the Cerro Grande Rehabilitation Project completes tree thinning and removal, emissions of volatile organic compounds and hazardous air pollutants should return to lower levels more typical of pre-fire conditions.

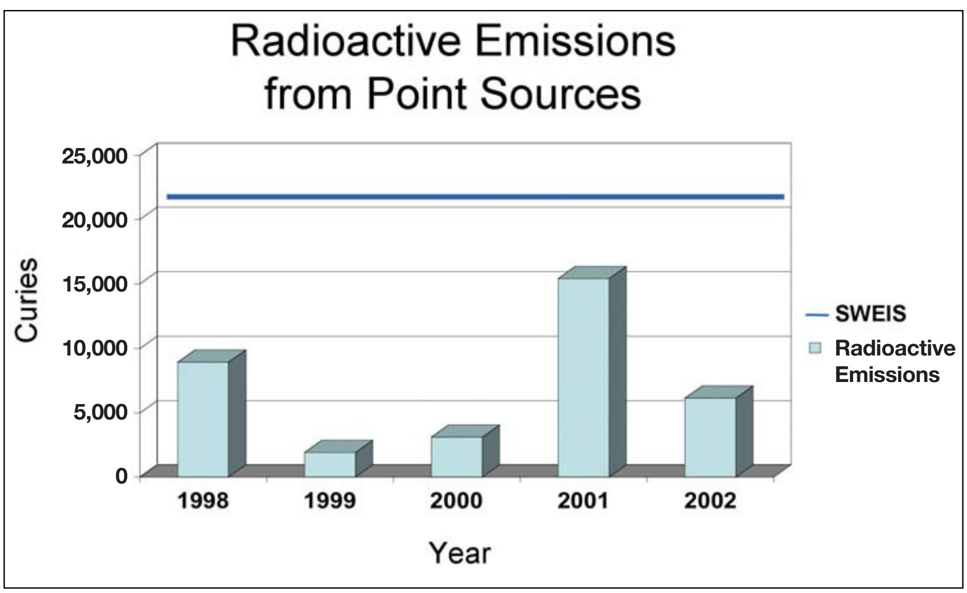


Figure 4-1. Total radioactive emissions from point sources.

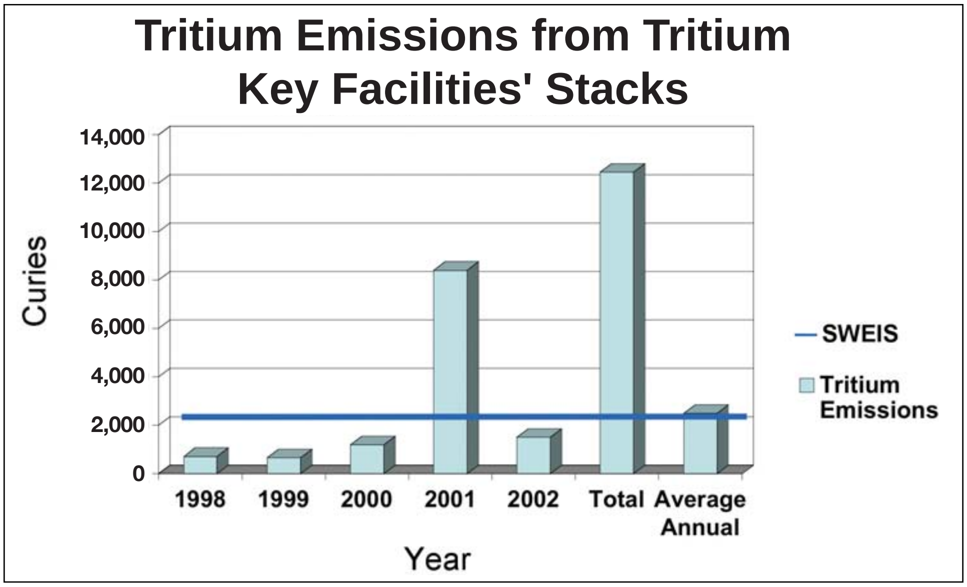


Figure 4-2. Tritium Emissions from Tritium Key Facilities' Stacks.

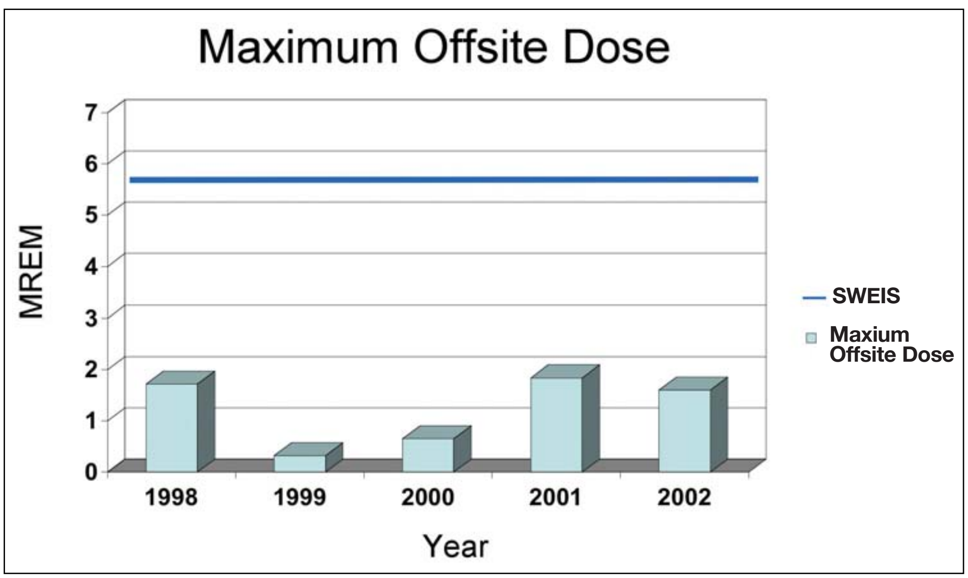


Figure 4-3. Maximun offsite dose.

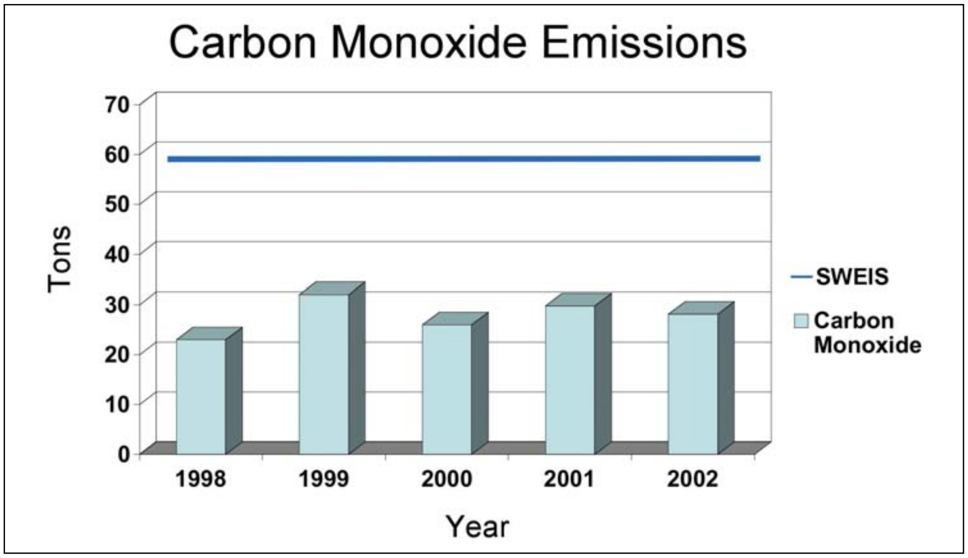


Figure 4-4. Carbon monoxide emissions.

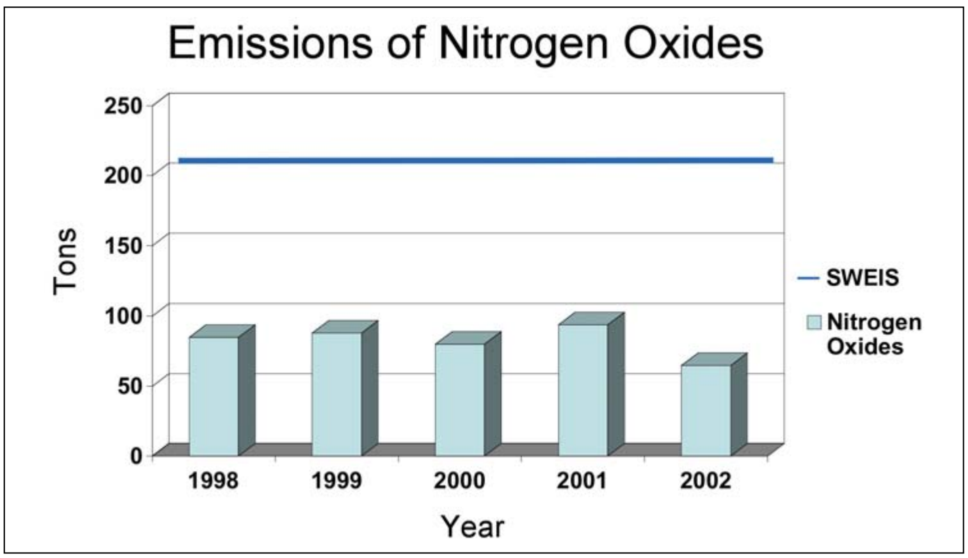


Figure 4-5. Emissions of nitrogen oxides.

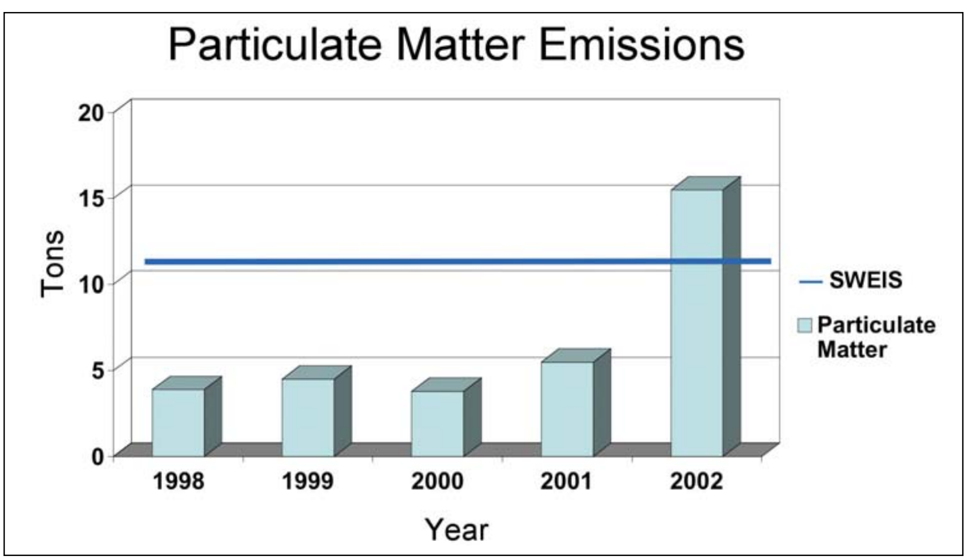


Figure 4-6. Particulate matter emissions.

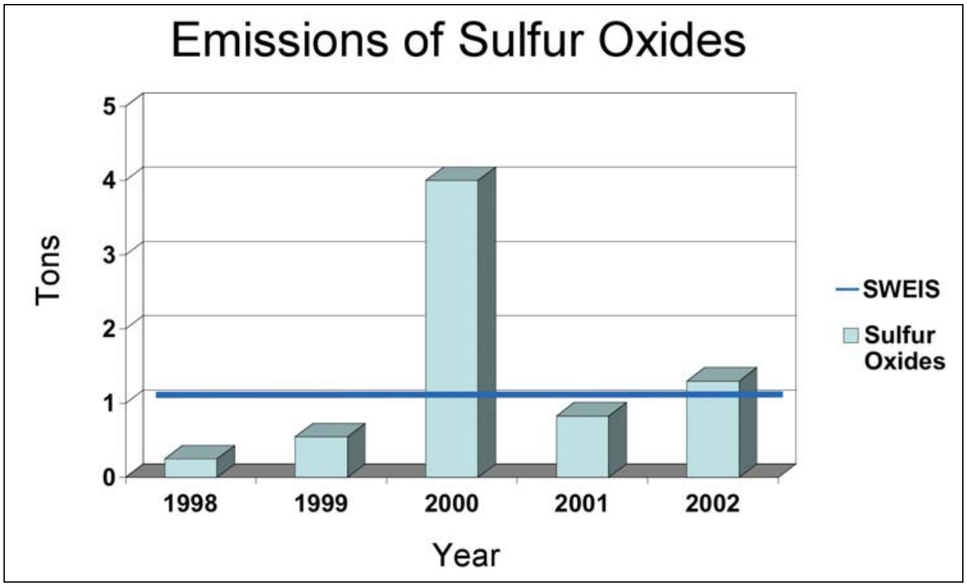


Figure 4-7. Emissions of sulfur oxides.

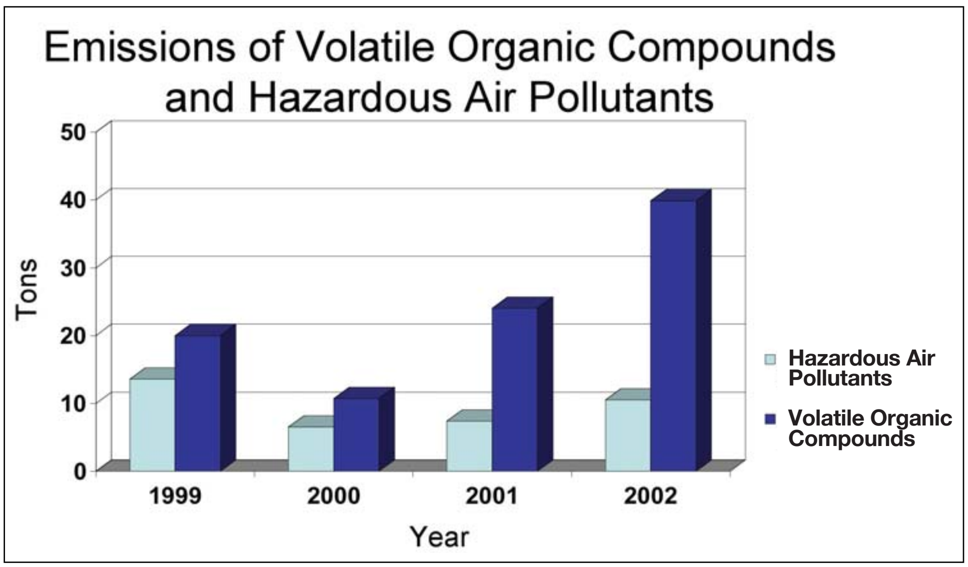


Figure 4-8. Emissions of volatile organic compounds and hazardous air pollutants.

4.2 Surface Water Quality

The number of permitted outfalls at LANL has decreased from 88 at the end of 1996 to 21 in 2002 (Appendix D). As a result of these closures, there has been an overall 44 percent decrease in flow over 1999 levels. Currently flow is about 64 percent of the level projected by the SWEIS. There was considerable uncertainty in both the SWEIS estimates and in the pre-2001 annual outfall volume estimates, when LANL began to measure rather than estimate flows. All of the watersheds at LANL, however, have had a decline in outfall volume to some degree since 1999, in part due to outfall closures. Discharges into Mortandad Canyon have decreased about 20 percent (7.9 million gallons per year) since 1999; outfall discharges into Water Canyon have decreased about 99 percent (about 12.9 million gallons per year) since 1999; Sandia Canyon outfall discharges have decreased by about half (105 million gallons per year) since 1999; and Los Alamos Canyon discharges have declined about 19 percent (about 8.4 million gallons per year) since 1999. In some watersheds, increased runoff resulting from the Cerro Grande Fire has produced greater than normal flows despite the closure of outfalls.

Examining sediment in a streambed

The SWEIS assumed that reducing outfall volumes would result in improved surface water quality since fewer contaminants would be discharged. It also assumed that water treatment improvements at the RLWTF and at the TA-16 HEWTF would contribute to higher surface water quality. The RLWTF, the HEWTF, and LANSCE outfalls are primary contributors to the local watersheds; all have substantially reduced effluent volumes (Figure 4-9). In addition, flows from the Sanitary Wastewater Treatment Facility at TA-46 and from the power plant at TA-03 discharge substantial volumes of water that feed Sandia Canyon and the Sandia Canyon wetland.

LANL effluent discharges by facility are listed in Table 3.2-4. The RLWTF discharges into Mortandad Canyon. The RLWTF outfall discharge has decreased about 52 percent—from 6.1 million gallons in 1998 to 2.92 million gallons in 2002. The HEWTF discharges into Water Canyon; the high explosive processing facilities have reduced liquid effluent from 17.1 million gallons in 1998 to 0.03 million gallons in 2002—a decrease of about 99.8 percent. LANSCE discharges have decreased from 53.4 million gallons in 1998 to 24.04 in 2002. LANSCE discharges primarily into Sandia Canyon and Los Alamos Canyon. LANL is currently developing a treatment facility to remove dissolved and suspended solids from effluent from the TA-03 power plant and from the Sanitary Wastewater Treatment Facility. The water will then be reused in cooling towers before discharge. This treatment process and water reuse is expected to result in about a 20 percent decrease in effluent flow into Sandia Canyon.

The SWEIS identified several areas where the level of contaminants, such as nitrates (which are regulated by the NPDES) in RLWTF effluent, would be reduced. The SWEIS also projected that outfall effluent quality would be similar to the baseline conditions or would improve. LANL's Environmental Surveillance Reports

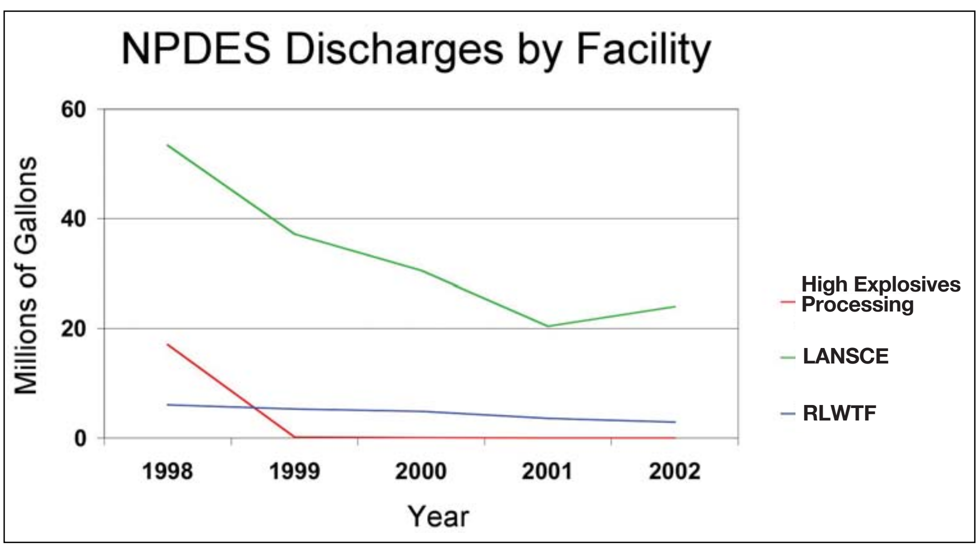


Figure 4-9. NPDES discharges by facility.

for 1998 to 2001 (LANL 1999a, 2000, 2001, and 2002a) show that outfall quality is within the parameters identified. In particular, nitrate concentrations in the RLWTF outfalls have been within NPDES limits since 1998.

4.3 Solid Radioactive and Chemical Wastes

Wastes have been generated at levels below quantities projected by the SWEIS ROD with the exception of ER Project chemical wastes. For three of the last five years, ER Project wastes (see Table 3.3.2-1) have been generated at levels at least seven times the SWEIS projection. ER Project wastes are typically shipped offsite for disposal at EPA-certified waste treatment, storage, and disposal facilities and do not impact local environs. These wastes result from exhumation of materials placed into the environment during the early history of LANL and thus differ from the newly created wastes from routine operations. Figure 4-10 compares the annual LANL chemical waste generation to the SWEIS ROD projections.

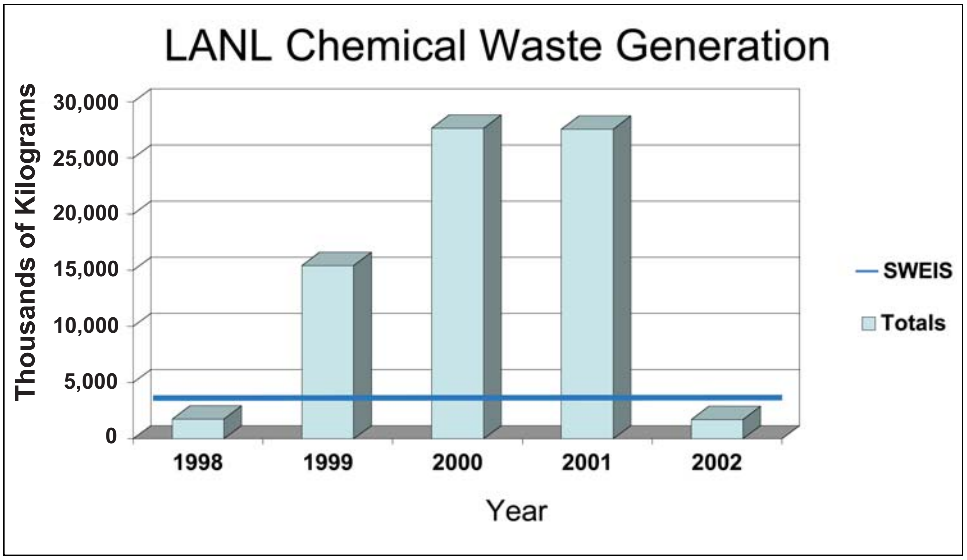


Figure 4-10. LANL chemical waste generation.

As a result of the uncertainty in ER Project waste estimates, the Yearbook presents totals for LANL waste generation both with and without the ER Project. As shown in tables in Section 3.3, except for chemical wastes, total generated amounts fall within projections made by the SWEIS ROD. This Yearbook also presents total volumes of solid sanitary waste for the first time.

Technical Area 54

Sanitary Waste

LANL sanitary waste generation and transfer of waste to the Los Alamos County Landfill has varied considerably over the last decade, with a peak (more than 14,000 tons) transferred to the landfill in 2000 that is probably due to removal of Cerro Grande Fire debris. The SWEIS estimated that LANL disposed of approximately 4,843 tons of waste at the Los Alamos County Landfill between July 1995 and June 1996 (DOE 1999). This estimate may have not been representative of LANL's sanitary waste disposal over the long term.

LANL has instituted an aggressive waste minimization and recycling program that has reduced the amount of waste disposed in sanitary landfills. LANL's Material Recovery Facility, which is used to separate recyclable items from other waste in trash dumpsters, now recovers about 40 percent of this waste for recycling. Other recycling initiatives include cardboard and paper recycling, a pilot concrete crushing operation, construction debris sorting, uncontaminated soil fill reuse, brush mulching, and metal and plastic recycling (LANL 2002b).

LANL performance goals for sanitary waste reduction are based on waste generation in 1993. LANL's total waste generation can be classified as routine and nonroutine. The waste can also be categorized as recyclable and nonrecyclable. Table 4.3-1 shows LANL sanitary waste generation for FY 2002. Compared to 1993, LANL has increased the recycled portion of sanitary waste from about 10 percent in 1993 to about 34 percent in FY 1999 and to approximately 70 percent in FY 2002.

Table 4.3-1. LANL Sanitary Waste Generation in FY 2002 (metric tons)

	ROUTINE	NONROUTINE	TOTAL
Recycled	1,425	5,938	7,363
Landfill disposal	1,822	1,388	3,210
Total	3,247	7,326	10,573

Routine sanitary waste consists mostly of food and food-contaminated waste, paper, plastic, wood, glass, styrofoam packing material, old equipment, and similar items. LANL's per capita generation of routine sanitary waste fell from 265 kilograms per person per year in 1993 to 163 kilograms per person per year in 2001, equivalent to a 39 percent decrease in routine waste generation (LANL 2002b).

Nonroutine sanitary waste is typically derived from construction and demolition projects. The Cerro Grande Rehabilitation Project also generated large quantities of nonroutine waste as a result of various cleanup activities. In general, construction and demolition waste is the largest single component of the sanitary waste stream and constitutes virtually all of the current nonroutine sanitary waste generation. Until May 1998, construction debris was used as fill to construct a land bridge between two areas of LANL; however, environmental and regulatory issues resulted in this activity being halted. Construction of new facilities and demolition of old facilities are expected to continue to produce substantial quantities of this type of waste. In FY 2002, approximately 82 percent of the uncontaminated construction and demolition waste was recycled (LANL 2002b). The portion of construction debris that is recycled is expected to remain the same or to increase in the future.

The SWEIS projected that the Los Alamos County Landfill would not reach capacity until about 2014. In 2002, NMED issued a 35-year permit for operation of the current landfill—five years of additional disposal of waste and 30 years of post-closure operation. Therefore, the existing landfill will no longer accept waste after 2007. Currently NNSA is preparing an environmental assessment of the effects of locating a new landfill within LANL boundaries. Other waste disposal alternatives may also be evaluated.

Chemical Waste

Waste projections for the ER Project by the SWEIS ROD are uncertain at best. These projections were developed in the 1996–1997 time period. Estimates were based on the then current Installation Work Plan methodology. The ER Project office kept a continuously updated database of waste projections by waste type for each PRS. Estimates were made for the amount of waste expected to be generated by that PRS for the life of the ER Project. In 1996–1997, it was assumed that the life of the ER Project would be 10 years, but the schedule now projects cleanup will extend to 2020. This demonstrates the legitimate uncertainty in waste estimates and schedules developed for the ER Project caused by changing requirements and refined waste calculations as additional data were gathered.

One task of the ER Project is to characterize sites about which little is known and to make adjustments in waste quantity estimates based on new information. In addition, even the most rigorous field investigations cannot truly determine waste quantities with a high degree of certainty until remediation has progressed considerably. Remediation can often create more or less waste, or waste that was not anticipated, based on field sampling. Moreover, the administrative authority may not approve a no further action recommendation or may require additional sampling or an alternative corrective action than the one planned. All of these factors lead to waste projections that are highly uncertain.

An example of the latter is MDA-P. The first closure plan for MDA-P was submitted to EPA, and later NMED, in the early 1980s. This plan proposed closure in place, but was never approved. During the mid- to late-1980s, all parties (LANL, DOE, EPA, and NMED) decided that clean-closure was a more appropriate standard and the plan was rewritten to reflect risk-based clean-closure. All information in the closure plan, including waste estimates, was based on best available information (a combination of operating group records and data from field investigations). However, when remediation started, it quickly became apparent that early information was not reliable, and that there would be more waste generated than originally anticipated. The ER Project clean closure of MDA-P began on November 17, 1997, and Phase I (i.e., waste management, handling, and disposal) and Phase II (i.e., confirmatory sampling) activities completed by April 2002. A total of 20,812 cubic yards of hazardous waste and 21,354 cubic yards of other waste were excavated and shipped to a disposal facility. A total of 6,600 cubic yards were shipped and used as clean fill at MDA-J.

Chemical waste quantities are higher than projections for two reasons: ER Project cleanup activities during 1999, 2000, and 2001 and the Legacy Materials Cleanup Project during 1998. The variability in ER Project waste projections is discussed above. The Legacy Materials Cleanup Project, completed in September 1998, required facilities to locate and inventory all materials for which a use could no longer be identified. All such materials (more than 22,000 items) were characterized, collected, and managed. In 1999, the Non-Key Facilities also exceeded projections, and this was attributed to ER Project cleanups of PRSs within the Non-Key Facilities. When comparing the subtotal of Key and Non-Key Facilities, only the Legacy Program in 1998 pushes the quantities over SWEIS ROD projections. Regardless, these wastes (both ER and Legacy Program) were and are shipped offsite, do not impact the local environs, and do not hasten the need to expand the size of Area G. High amounts of chemical waste at Non-Key Facilities are mostly due to new construction and some expanded operations.

Low-Level Waste

LANL generation of LLW (see Table 3.3.3-1) is generally below that projected in the SWEIS ROD (Figure 4-11). Although data from 2002 show that SWEIS projections were exceeded by both the Non-Key Facilities and the ER Project, total waste volumes remain within SWEIS projections.

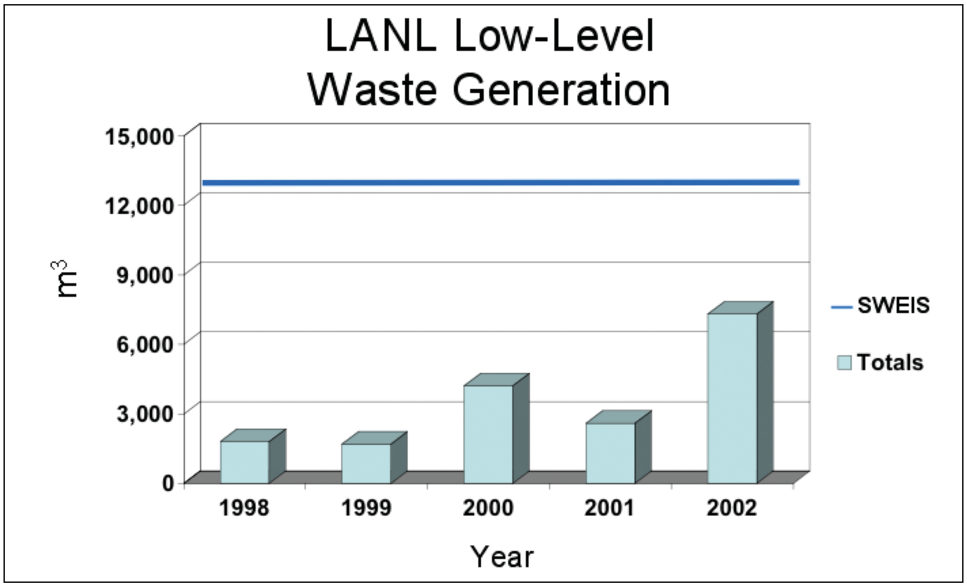


Figure 4-11. LANL low-level waste generation.

Mixed Low-Level Waste

Table 3.3.4-1 shows a significant increase in MLLW in 2000. The total LANL MLLW volume for 2000 was 598 cubic meters; 575 cubic meters of that came from the MDA-P cleanup. Waste generation returned to more typical levels in 2001 and 2002. Even with the noticeable increase in 2000, the generation of MLLW remains within SWEIS projections (Figure 4-12).

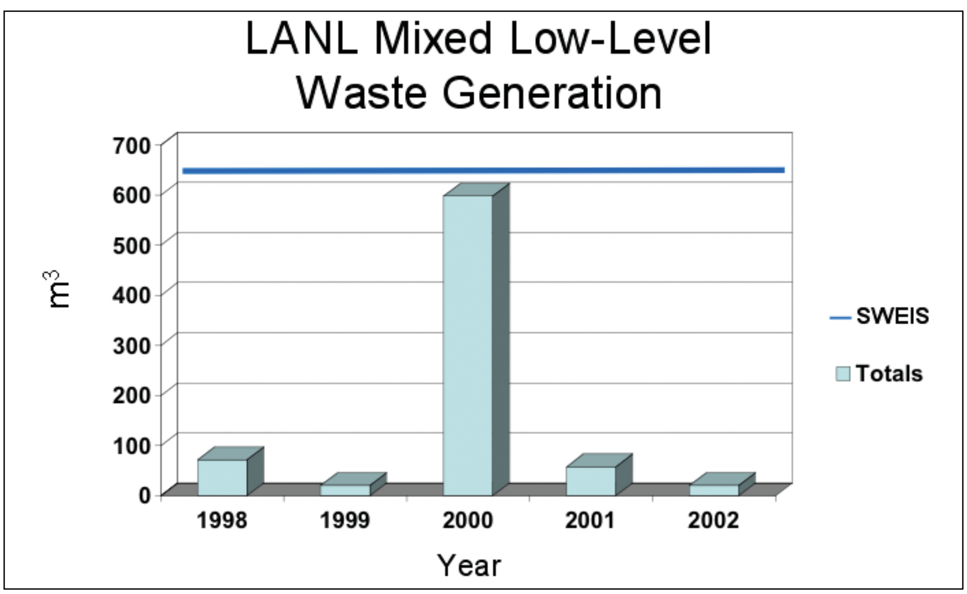


Figure 4-12. LANL mixed low-level waste generation.

TRU and Mixed TRU

Despite the expected slow, but increasing, levels of activity on pit production and related programs, generation of TRU (see Table 3.3.5-1) and mixed TRU waste (see Table 3.3.6-1) remained within the projections of the SWEIS ROD (Figures 4-13 and -14). Increasing levels of effort in the pit production program and related programs are expected to result in increasing quantities of these waste types in the near future but are not expected to exceed SWEIS projections. LANL's Offsite Source Recovery (OSR) Program has generated TRU waste that is considered to be a waste from Non-Key Facilities. The SWEIS did not anticipate TRU waste generation from Non-Key Facilities. A separate NEPA review was conducted for the OSR Program and the effects of implementing the program were determined to be bounded by the SWEIS impact analysis (DOE 2000).

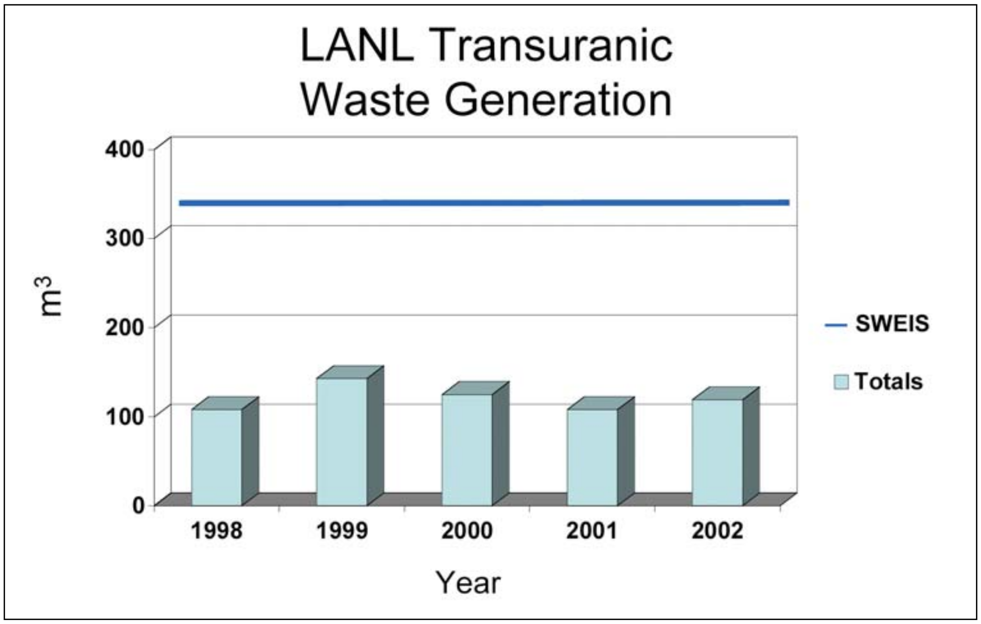


Figure 4-13. LANL transuranic waste generation.

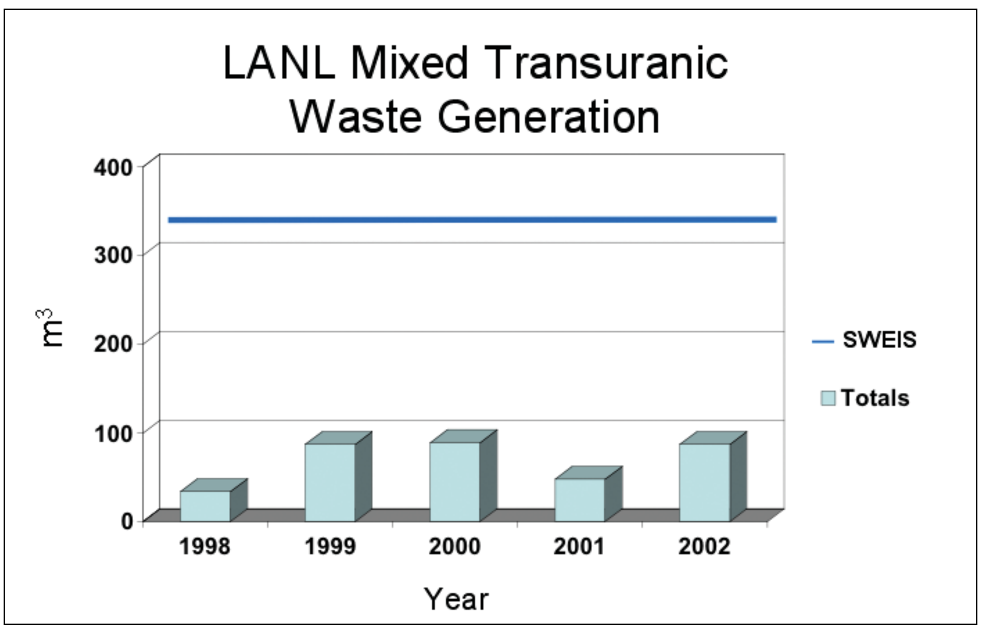


Figure 4-14. LANL mixed transuranic waste generation.

4.4 Utility Consumption

Consumption of these commodities is restricted by contract. Utility usage is compared to the SWEIS ROD projections of annual use. Section 3.4 presents these three sets of data (gas [see Table 3.4.1-1], electricity [see Tables 3.4.2-1 and 3.4.2-2], and water [see Table 3.4.3-1]) and demonstrates that none of these measured utilities exceeded SWEIS ROD projections, except for natural gas in 1993, which is before the 10-year window evaluated by the SWEIS ROD. Based on these data, it appears that utility usage remains within the SWEIS ROD environmental envelope for operations (Figures 4-15, -16, -17, and -18).

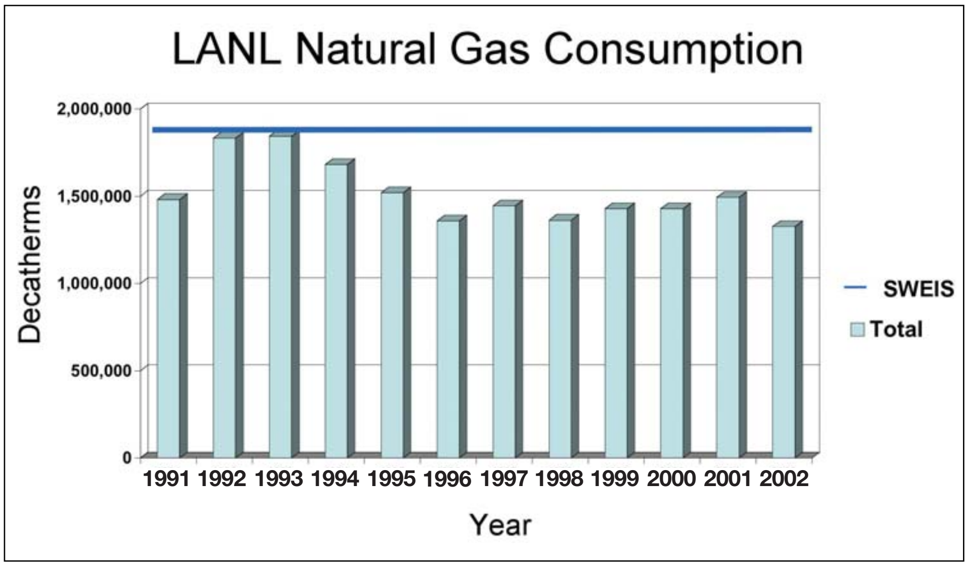


Figure 4-15. LANL natural gas consumption.

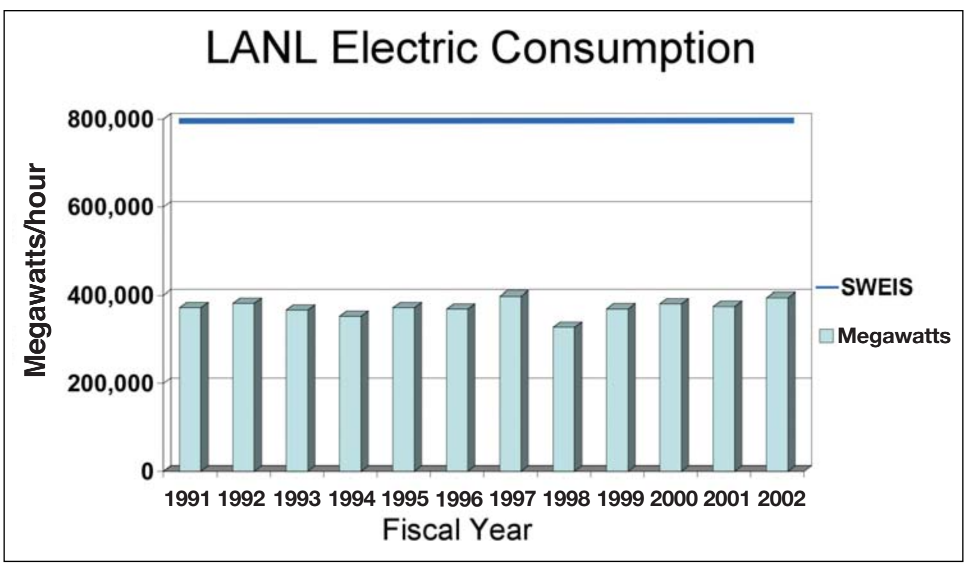


Figure 4-16. LANL electric consumption.

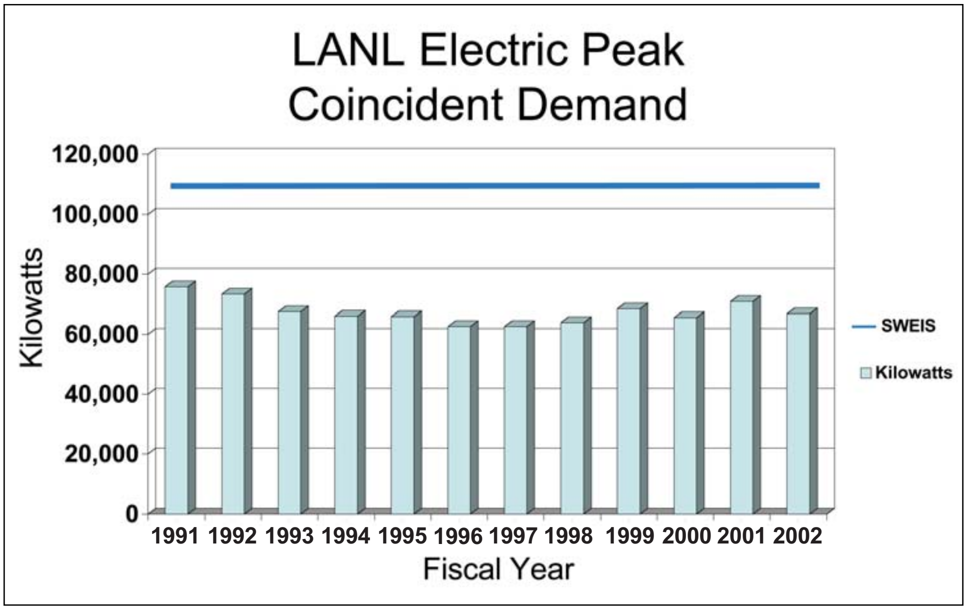


Figure 4-17. LANL electric peak coincident demand.

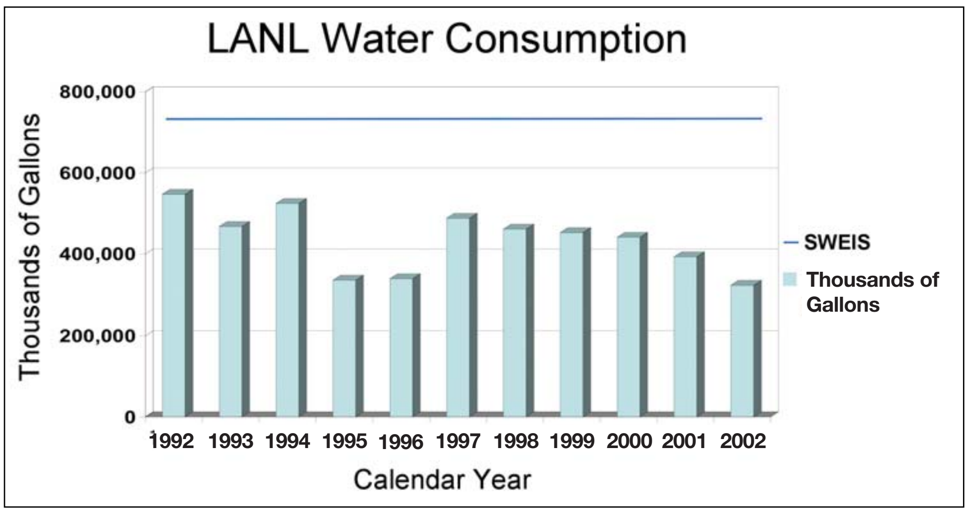


Figure 4-18. LANL water consumption.

4.5 Worker Safety

The SWEIS ROD projected 507 reportable occupational injuries (TRI) per year. Despite a small increase in 2002 in TRI and lost workday cases (LWC), the 2002 data represent about half of the projected reportable injuries in the SWEIS ROD (see Table 3.5.1-1). The overall trend has been downward since 1996 (Figures 4-19 and -20).

Radiological exposures to LANL workers (see Table 3.5.2-1) are well within the levels projected by the SWEIS ROD (Figure 4-21). There is considerable variation from year to year but in no case are the doses more than one-third the SWEIS projected level. Likewise the number of workers with nonzero doses remains below the SWEIS projection, typically half or less the number projected.

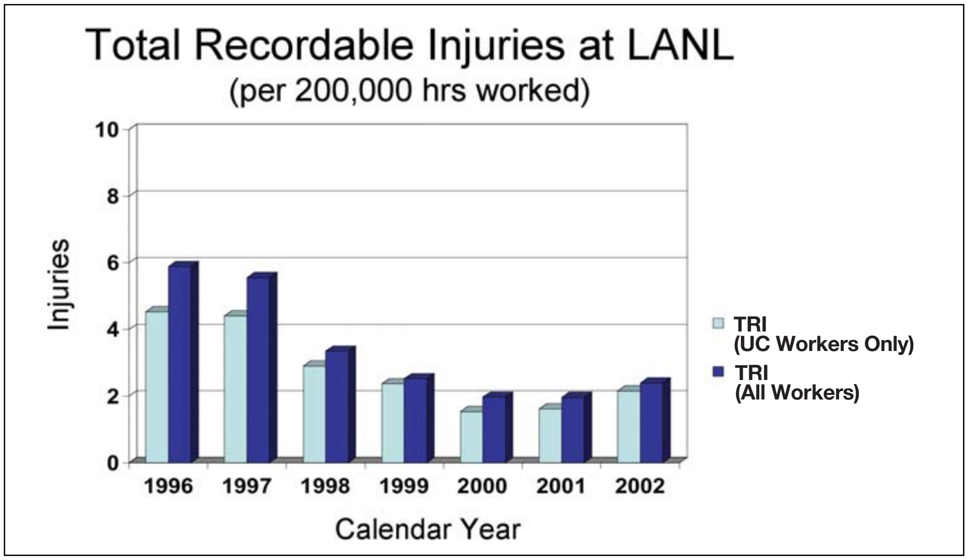


Figure 4-19. Total recordable injuries at LANL.

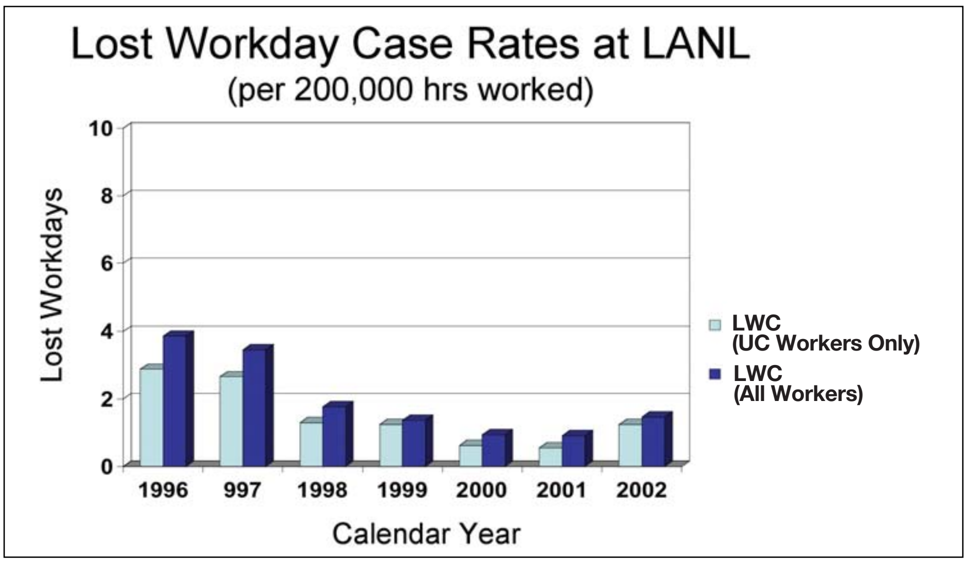


Figure 4-20. Lost workday case rates at LANL.

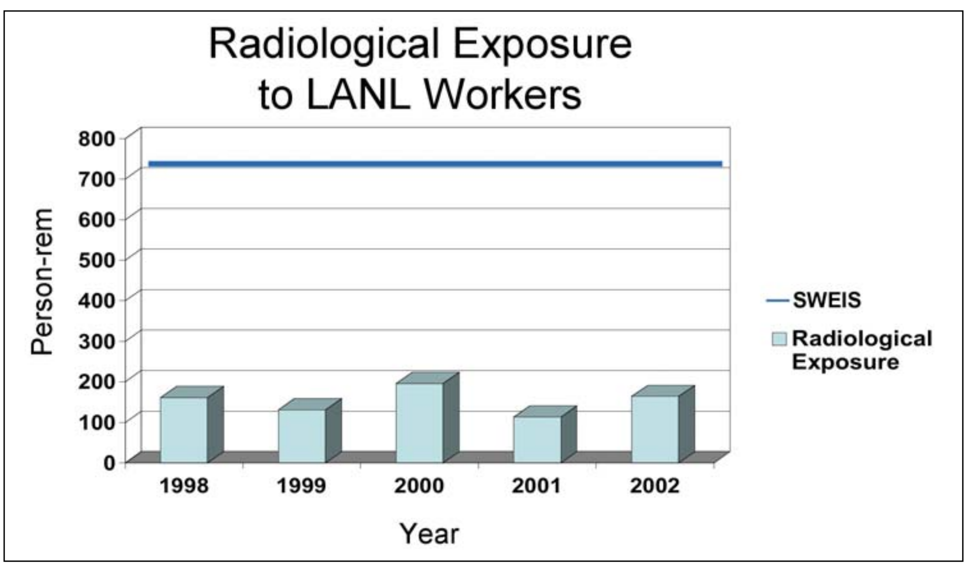


Figure 4-21. Radiological exposure to LANL workers.

4.6 Socioeconomics

The SWEIS ROD projected a workforce (UC and contractors) of 8,740 persons (see Table 3.6-1). Since 1996 the size of the workforce has increased steadily. Currently, it exceeds the SWEIS projection by nearly 1,200 persons (an increase of about 14 percent). The expected result of this increase is a somewhat greater positive impact on the economy of northern New Mexico.

4.7 Land Resources

Land use at LANL is a high-priority issue. Most of the undeveloped land is either required as buffer zones for operations or is unsuitable for development. Therefore, loss of available lands through development or Congressionally mandated land transfer has a significant impact on strategic planning for operations. Conversely, increases in available lands through cleanups performed by the ER Project and demolition of vacated buildings also affect strategic planning. To date, however, the ER Project has not significantly added to available land.

In 2002, the first of the Congressionally mandated conveyance of land to the County of Los Alamos and transfer to the Pueblo of San Ildefonso were accomplished. These disbursals effectively removed 2,209 acres from LANL and made them unavailable for LANL operational uses.

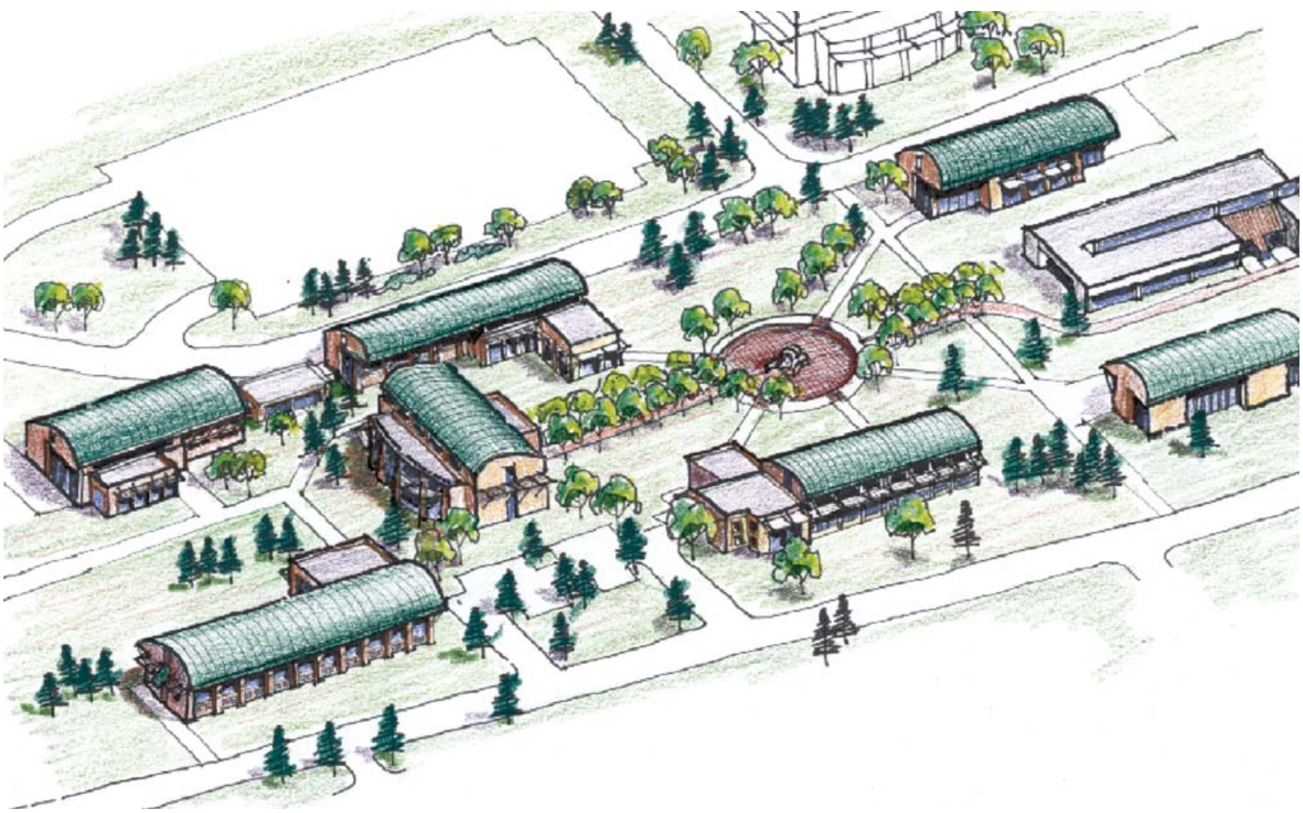
The SWEIS ROD did not anticipate any significant effects on land use. Land uses within LANL boundaries have not changed substantially since the SWEIS was issued (see Table 3.7.5-1) and are not expected to change in the next few years. Future development will be consistent with LANL's CSP2000 (LANL 1999b), which guides LANL land development.

Results of tree-thinning effort along Pajarito Road

Though construction and modification often result in substantial loss of greenfields (previously undeveloped areas), this has not been the case for the period 1998–2002. For this Yearbook, the amount of greenfield and brownfield (previously developed areas) development was estimated using geographic information system data relating to LANL's larger ground-disturbing projects. The estimates do not include small facility projects, such as installing short utility lines. Nor do they include emergency activities performed during the Cerro Grande Fire, such as cutting firebreaks. Although the Cerro Grande Rehabilitation Project thinned trees over a large portion of LANL, both greenfield and brownfield areas, the basic character (greenfield or brownfield) was not altered by these actions.

LANL's major projects between 1998 and 2002 have affected or will affect (in some cases, actual construction has not begun) about 247 acres. About 117 acres of greenfield (about 30 acres attributable to the Research Park) have been developed or proposed for development; the remaining 120 acres consist of brownfield areas. Most of the greenfield development consists of installation of monitoring wells and new utilities and creation of short access roads. Cerro Grande Rehabilitation Projects, such as the Flood Retention Structure in Pajarito Canyon, also contributed significantly to the total.

Future construction at LANL is incorporated in various facility strategic plans. A common component of these plans is consolidation of dispersed activities into central areas. As a result, future construction will frequently be concentrated in areas that are already developed or are adjacent to developed areas, thus reducing future greenfield loss.



Conceptual design of the proposed DX Complex

4.8 Groundwater

The SWEIS ROD projected that LANL operations would have a negligible effect on groundwater availability and quality but acknowledged that more information about the regional aquifer system was needed. The SWEIS projected an onsite drawdown in the level of the main aquifer of about 15.6 feet. Drawdown of aquifers remains a regional concern. However, the decline is gradual, typically about one to two feet per year with most production wells exhibiting recovery within 6 to 12 months after pumping stops.

The SWEIS projected that trace levels of tritium would continue to be found in groundwater. Trace levels of tritium continue to be found in monitoring wells, as well as some perchlorates, nitrates, high explosives constituents, uranium, and other contaminants in the perched or regional aquifers (see Table 3.8-1). Although a number of regional water monitoring wells have been drilled over the last few years, there are still uncertainties about the quality and quantity of groundwater. It is expected that these uncertainties will be resolved as additional data are gathered from the network of monitoring wells.

Sampling and analysis of water from production wells indicate that the water in the regional aquifer below the Pajarito Plateau is of high quality and meets or exceeds all applicable water quality standards. Therefore, the SWEIS projections of groundwater quality and quantity still bound existing groundwater conditions as they are currently understood.

4.9 Cultural Resources

Cultural resources surveys, particularly those conducted after the Cerro Grande Fire, have increased the number of cultural properties identified at LANL (see Table 3.9-1). The area of LANL that has been systematically surveyed has increased from 17,937 acres in 1998 (about 64 percent) to 22,476 acres (88 percent of LANL's remaining area after 2002 land transfers) in 2002. Post-fire conditions also enhanced the identification of low-visibility sites. Thus the number of known cultural properties has increased from 1,369 in 1998 to 1,835 in 2002. The increase in acreage surveyed and properties identified does not affect any SWEIS projection.

TA-8 Gun Site, a Manhattan Project Era building

LANL has also increased the inventory of historic buildings dating to the Manhattan Project and Cold War period. At the same time, LANL has begun to replace these older buildings with modern facilities. Since about 1995, 42 historic buildings have been documented and a number of them have been demolished. As plans for consolidated operations, infrastructure upgrades, and facility modernization proceed in accordance with LANL's CSP2000 and various facility strategic plans, more of the historic buildings will be demolished. The SWEIS ROD, which projected limited new construction, did not address the effects of historic building demolition.

4.10 Ecological Resources

The SWEIS stated that LANL's planned activities would enhance biological resources. Under the Habitat Management Plan (LANL 1998), LANL operations are evaluated against specified criteria to protect sensitive species. Since 1999 LANL has evaluated approximately 2,500 projects for compliance with the Habitat Management Plan. About 305 projects were modified to meet Plan criteria. A few projects could not be modified to meet these criteria and were independently reviewed by the US Fish and Wildlife Service. Some of these projects are still in the planning stages; others have been completed. Approximately 24.6 acres of undeveloped core habitat and 37.8 acres of undeveloped buffer zone would be affected by these projects.

The Habitat Management Plan restricts new development within the buffer zone to 25 percent of each Area of Environmental Interest buffer. LANL projects typically would affect, or have affected, less than 2 percent of a given Area of Environmental Interest.

The SWEIS identified approximately 50 acres of wetlands within LANL. Thirteen acres of these wetlands are supported in whole or in part by effluent from LANL outfalls. With the reductions in effluent flow noted in Section 4.2, the total area of wetlands is less than what it was when the SWEIS was prepared. The effect of closing or reducing effluent flow on these 13 acres of wetlands was assessed in the *Environmental Assessment for the Outfall Reduction Program* (DOE 1996). The environmental assessment determined that the potential loss of the affected wetlands was not significant. The actual reduction in wetland area has not been verified by field study.

Cerro Grande Fire survivor

Wetland in Pajarito Canyon

4.11 Visual Resources

The SWEIS identified some existing adverse visual resources conditions, specifically the austere and industrial character of many LANL buildings, incompatible building styles at TA-03, and highly visible tall structures that disrupted panoramic views. The SWEIS projected that, in addition to these continuing visual conditions, certain new construction and associated lighting (a possible waste disposal facility at TA-67 and a new road from TA-03 to TA-55) would have minor effects on visual resources. However, these projects were not selected in the SWEIS ROD.

Several new construction projects, not anticipated by the SWEIS, have been completed or are under development. Construction at TA-03 has reduced the number of incompatible building styles and will provide additional landscaping to create a more unified visual environment. Construction in other areas, such as TA-16, is enabling the removal of some of the austere industrial buildings that the SWEIS identified as adverse visual resources conditions. Other buildings will be refurbished and surface treatments applied so that there is greater architectural consistency. Landscaping will also reduce the industrial character of these areas.

None of the tallest buildings in the LANL viewscape have been removed but several are slated for demolition. The new National Security Sciences Building, the replacement for Building TA-03-46 that may be several stories high, is likely to be visible in the viewshed but it will be compatible with recent construction in the TA-03 area. Radio towers have been erected and are visible from some distance but due to their color, they blend to some extent with the background. Because lighting associated with new construction will comply with the New Mexico Night Sky Protection Act, there should not be any substantial degradation of night sky conditions. As a consequence, LANL operations have remained and should remain within the SWEIS projections.

4.12 Long-Term Effects

To date, LANL has continued to operate within the projections made by the SWEIS ROD. None of the measured parameters exceed SWEIS ROD projections or regulatory limits. Thus, long-term effects should remain within the projections made by the SWEIS ROD.

4.13 References

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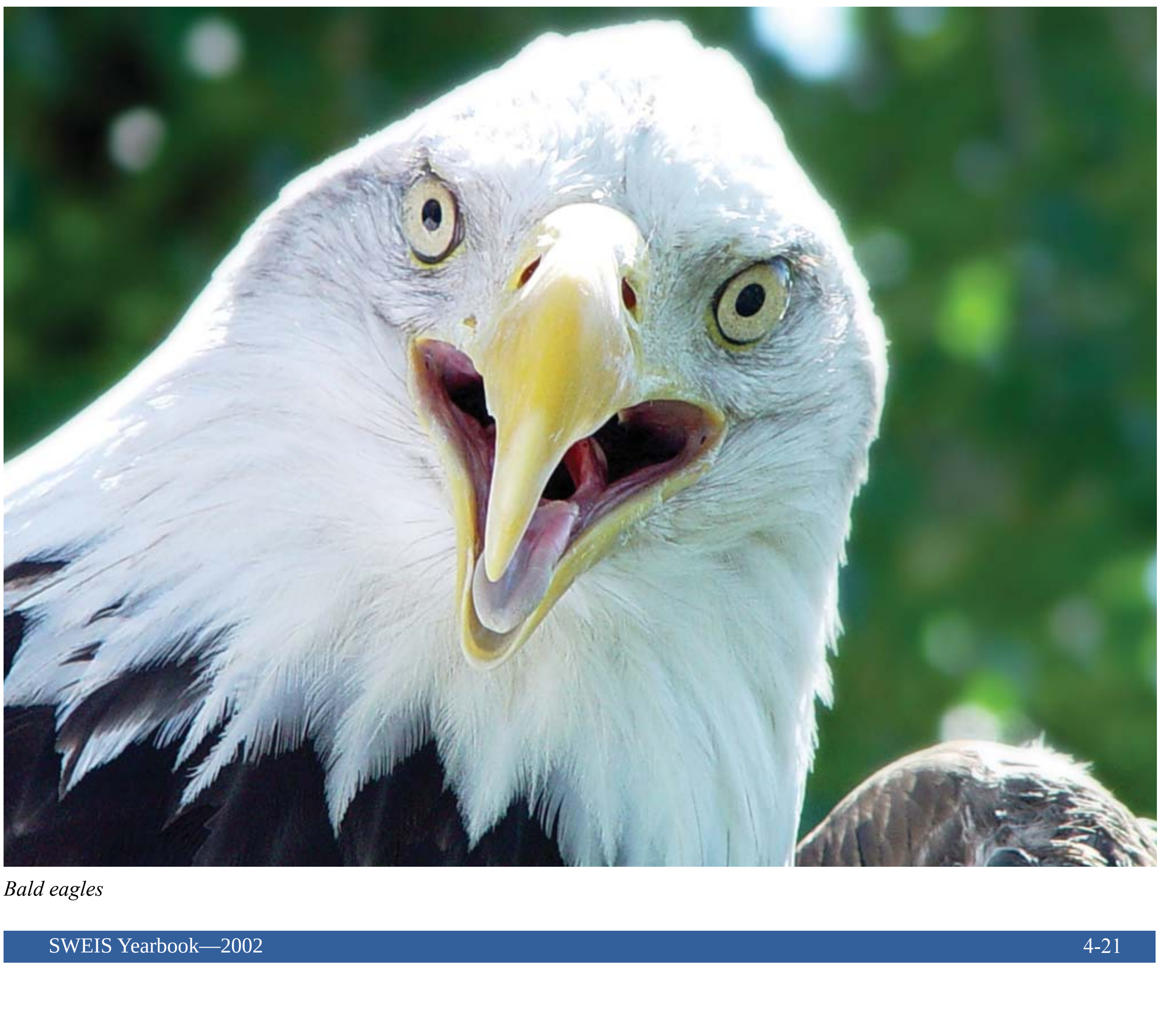


Bald eagles

The Past

V-Site building related to the Trinity device test assembly area

Before the Cerro Grande Fire

After the Cerro Grande Fire

50th Anniversary—CMR

The Present—2002

Nonproliferation and International Security Center

The Future

Conceptual design of the Materials Science and Technology Building

Conceptual design of the Emergency Operations Center

5.0 Ten-Year Comprehensive Site Plan

This chapter presents a brief overview of DOE/NNSA's long-range planning process at LANL (LANL 2001a, 2002a). Because this planning process is used to address what happens to facilities and infrastructure at LANL, it ties into the SWEIS. The plan is updated annually and identifies what will be retained, maintained, modified, demolished, or replaced at LANL. Even though portions of this chapter may appear to be redundant with previous chapters of this report, the material presented here looks forward to the next 10 years, whereas the preceding chapters look backwards at the past five years (1998 through 2002).

The proposed projects identified in the plan are designed to

- consolidate facility operations into fewer/smaller facilities providing for more efficient facility operations in support of missions;
- consolidate nuclear materials facilities;
- replace vulnerable "temporary" structures with long-term office and light laboratory space;
- upgrade or replace infrastructure—electricity, water, waste water, natural gas, roads—and protection and communications systems; and
- construct or modify existing facilities to meet specific program needs.

The average age of the Laboratory's eight million square feet of facilities is over 40 years. Each project is designed to improve safety, security, employee morale and retention, and to reduce maintenance and operations costs. The Laboratory plans to eliminate two million of its existing eight million square feet over the next 10 to 12 years.

The following five sections parallel sections of the LANL TYCSP for FY 2003 (LANL 2002a). Each section provides a brief overview of information pertinent to the SWEIS envelope.

5.1 Introduction

5.1.1 Overview

The TYCSP is a long-range site-planning document initially delivered to DOE in September 2001 (LANL 2001a) with an updated plan delivered in October 2002 (LANL 2002a). This document serves as the link between long-range planning, proposed projects, and the budget. In doing so, the document connects the institutional plan, program plans, comprehensive site plans, and the SWEIS. The TYCSP was restructured in FY 2003 and provides information on the following topics:

- general site information,
- facility and infrastructure cost summary,
- production readiness and plant capacity,
- summary of missions and alternatives/requirements tables, and
- project lists.

The plan integrates institutional planning efforts for mission and programs, workforce, facilities, security, utilities, environment, safety, health, and operations.

5.1.2 Assumptions

The Laboratory used the following assumptions in developing the FY 2003 TYSCP.

- The Laboratory's core mission and programs will remain largely unchanged over the next 10 years.
- The primary funding sources in support of the physical plant are Readiness in Technical Base and Facilities (RTBF), Facilities and Infrastructure Recapitalization Program (FIRP), Integrated Construction Program Plan, Institutional General Plant Project, and program-specific funding.
- Funding targets for the RTBF Operations of Facilities and FIRP projects/activities cost projections are based on the Future Years Nuclear Security Program.
- Consolidation will have to achieve cost savings.
- The facility management realignment to a more centralized management structure will reduce operating costs.
- Significant increases in physical site security will be considered.

5.1.3 Current Situation

Los Alamos has the oldest and the greatest number of facilities among the three weapons laboratories and DOE-Nevada operations. The cost of equipment maintenance, integrated safeguards and security management, environmental compliance, urgent maintenance, and operations for the Laboratory's old facilities is expensive and growing. As a result, the Laboratory is exploring prioritization of maintenance and replacement as well as consolidation of operations. Maintenance backlogs are a designated baseline and are being defined to maximize benefit from the resources expended on these older facilities.

5.1.4 NEPA

The Laboratory remains committed to complying with NEPA requirements. The Laboratory performs NEPA reviews on several hundred projects each year. A recommendation on the level of NEPA review (categorical exclusion, environmental assessment, or environmental impact statement) is submitted to NNSA where a decision regarding the need for and the level of NEPA documentation is made. Once NEPA is completed, a project can proceed after NNSA notifies the Laboratory that a categorical exclusion is completed, a Finding of No Significant Impact is signed for an environmental assessment, or a ROD is published for an environmental impact statement.

5.1.5 Changes and Accomplishments from the 2002 TYCSP

In addition to specific project-related changes, changes occurred in the TYCSP document and processes. The changes include

- modifying the TYCSP to respond to and align with guidance changes such as document format and content, budget realities, and determination of historical significance and future excess facilities;
- reflecting October 2001 restructuring;
- addressing the DOE Gap analysis;
- enhancing facility strategic planning;
- expanding the information base on utilities, transportation, parking, and plant capacities;
- planning for physical security; and
- developing a sustainable design guide.

5.2 Site Description

The site, i.e., LANL, has been described in the SWEIS (DOE 1999a). This description includes the physical location of LANL as well as the environment affected by LANL. The environment covers factors such as population, economy, land use, adjacent landowners, water availability, air quality, threatened and endangered species, and archeology and cultural resources.

5.2.1 Geographic Setting

The geographic setting of the Laboratory is similar to what was described in the SWEIS. The differences are the impact of the Cerro Grande Fire on the plant communities and a change in public access due to heightened security. The public is currently allowed limited access to certain areas along State Routes 4, 501, and 502. Access to most of Pajarito Road is now restricted by the DOE.

Aerial view of Los Alamos mesas

5.2.2 Laboratory Resources

Basic information on the regional ecosystem encompassing the Laboratory and resources specifically at the Laboratory are drawn from the SWEIS and supporting documentation. Regional ecosystem data include brief summary descriptions of the canyons, watersheds, wetlands, and major vegetation zones. Brief summary descriptions of the resources for integration include the topics of air, water, surface water, ground water, soils, biological, wildlife, forest, and cultural and historic.

5.2.3 Land

The Laboratory is divided into 49 separate technical areas with location and spacing that reflect the site's historical development patterns, regional topography, and functional relationships. There are asphalt roads and parking areas. In addition, the Laboratory has many unpaved roads and remote high explosives testing or firing sites.

5.2.3.1 Land Use

Table 5.2.3.1-1 summarizes the current land use and the land use projected for the future. The major land-use changes involve consolidation of Nuclear Materials Research and Development and the expansion of Experimental Science.

Figure 5-1 shows the existing land use at LANL, and Figure 5-2 shows the future land use.

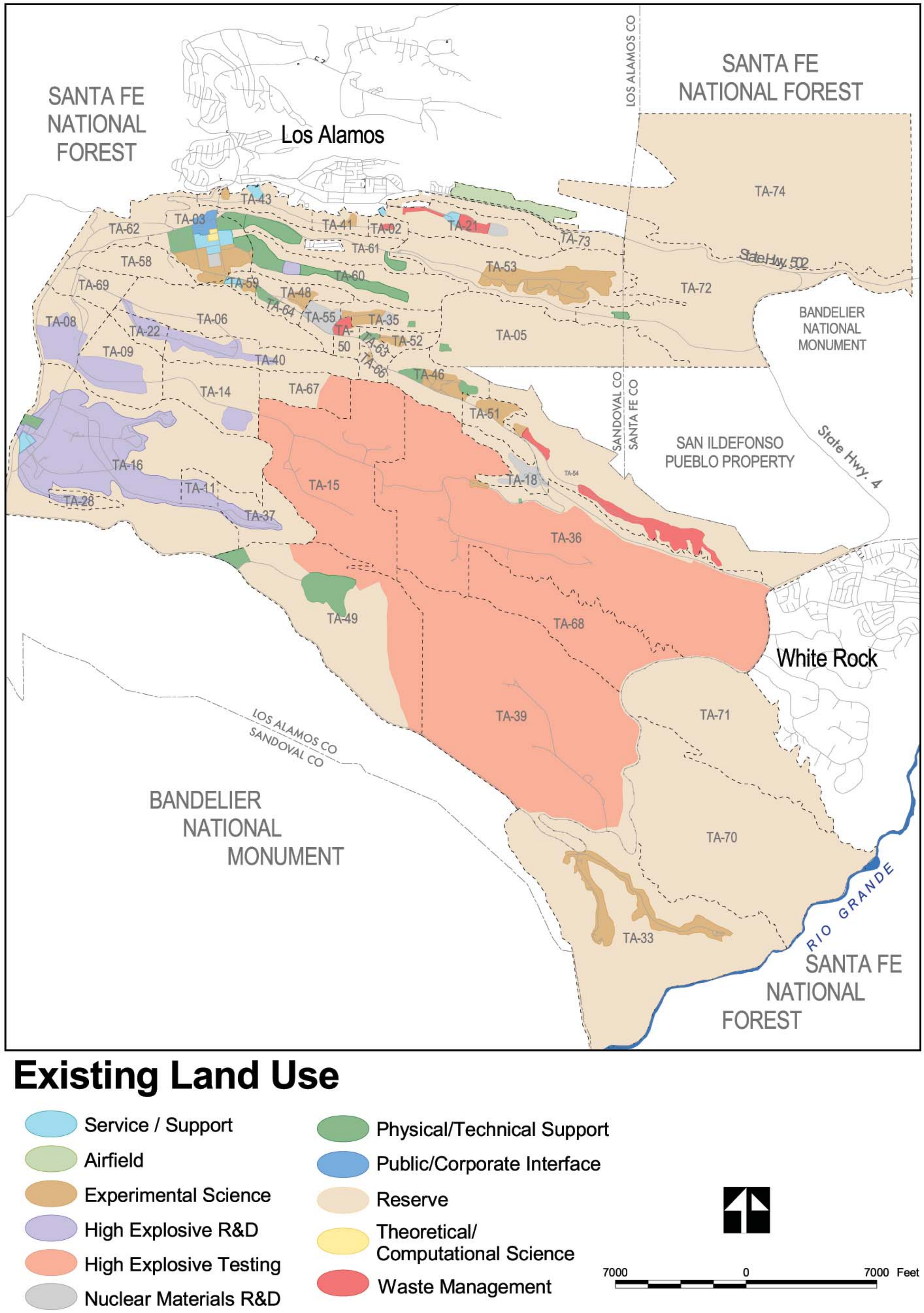


Figure 5-1. Existing land use at LANL.

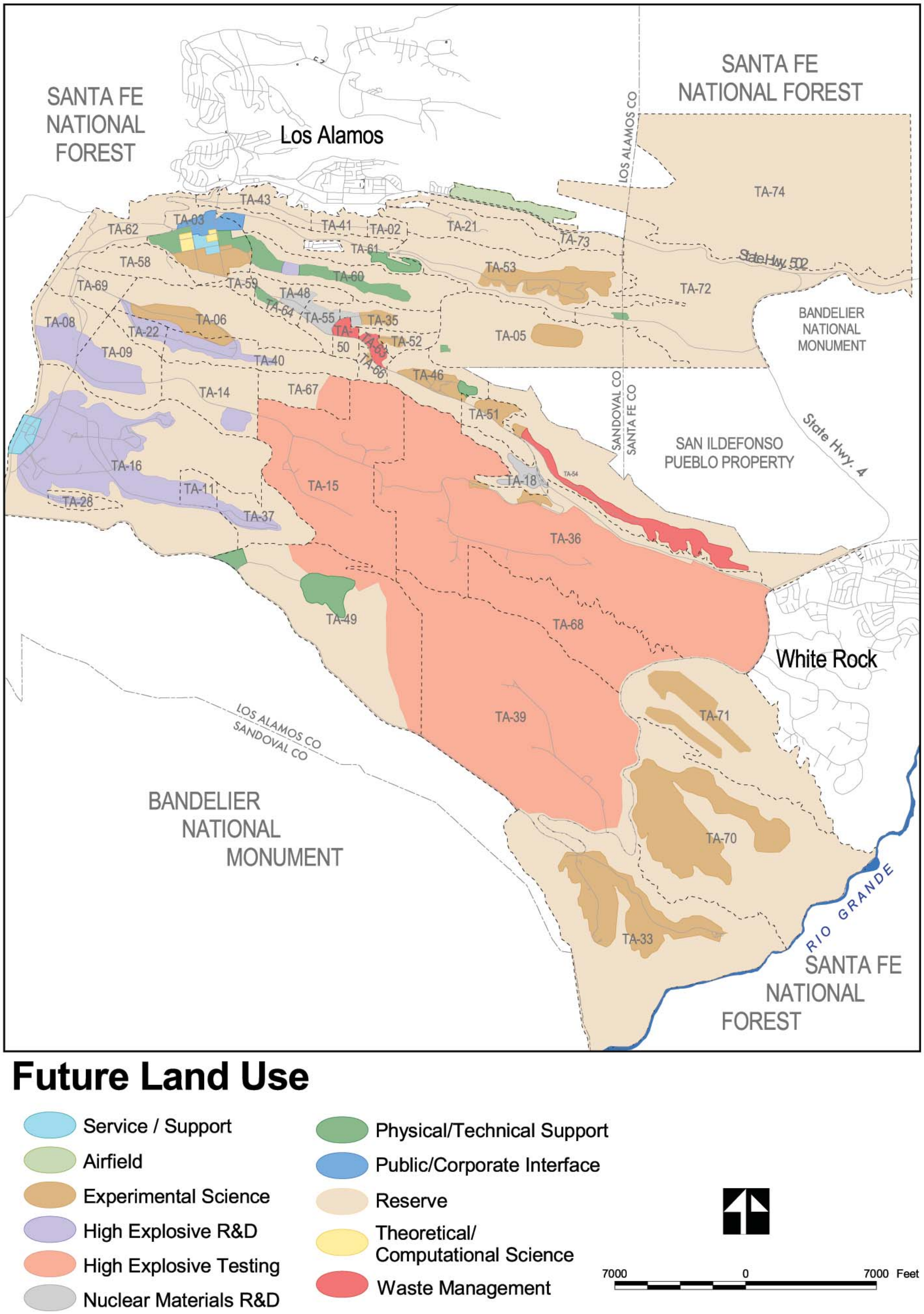


Figure 5-2. Future land use at LANL.

Table 5.2.3.1-1. Site-Wide Land Use

LAND USE CATEGORY	EXISTING LAND USE ACREAGE	FUTURE LAND USE ACREAGE
Service/Support	140	161
Experimental Science	514	544
High Explosives Research and Development	1,310	1,436
High Explosives Testing	7,096	7,096
Nuclear Materials Research and Development	374	42
Physical/Technical Support	336	340
Public/Corporate Interface	31	24
Theoretical/Computational	2	22
Waste Management	186	231
Reserve	17,874	17,856 [a]
Total	27,863	27,482

[a] Land conveyance and transfer may include up to 4,046 acres by November 2007. The first transfer occurred in 2002. All of this acreage is included in the reserve land use category.

5.2.3.2 Land Transfer

On November 26, 1997, Congress passed Public Law 105-119. Section 632 of that law directed the Secretary of Energy to convey to the Incorporated County of Los Alamos, New Mexico, or to the designee of the County and transfer to the Secretary of the Interior, in trust for the Pueblo of San Ildefonso, parcels of land under the jurisdictional administrative control of the Secretary at or in the vicinity of LANL. Such parcels, or tracts, of land had to meet the suitability criteria established by the law, that is, they were not required for the national security mission before the end of 11/26/2007; could be restored or remediated by 11/26/2007; and were suitable for historic, cultural, or environmental preservation, economic diversification, or community self-sufficiency. The DOE[1] identified 10 tracts of land for potential conveyance to the County of Los Alamos or transfer to San Ildefonso Pueblo. These 10 tracts of land have been further divided into subparcels for disbursal purposes.

The 10 tracts, which total approximately 4,600 acres, are shown in Figure 5-3 and include the following:

- TA-21 tract, 244 acres - located on the eastern end of the same mesa on which the central business district of Los Alamos is located.
- DP Road tract, 50 acres - located between the western boundary of TA-21 and the major commercial districts of the Los Alamos townsite.
- DOE Los Alamos Area Office tract, 13 acres - located within the Los Alamos townsite between Los Alamos Canyon and Trinity Drive.
- Airport tract, 198 acres - located east of the Los Alamos townsite, close to the East Gate Business Park.
- White Rock tract, 99 acres - located north of Pajarito Acres residential development and west of the White Rock townsite.
- Rendija Canyon tract, 909 acres - located north of and below Los Alamos townsite's Barranca Mesa residential subdivision.
- White Rock Y tract, 435 acres - a complex area that incorporates the alignments and intersections of State Routes 502 and 4 and the easternmost part of Jemez Road.
- Site 22 tract, 0.3 acres - located at the edge of the Los Alamos townsite mesa, south of Trinity Drive and above Los Alamos Canyon.

[1] Congress established the NNSA within the DOE to manage the nuclear weapons program for the United States. LANL is one of the facilities now managed by the NNSA. The NNSA officially began operations on March 1, 2000. Its mission is to carry out the national security responsibilities of the DOE, including maintenance of a safe, secure, and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program.

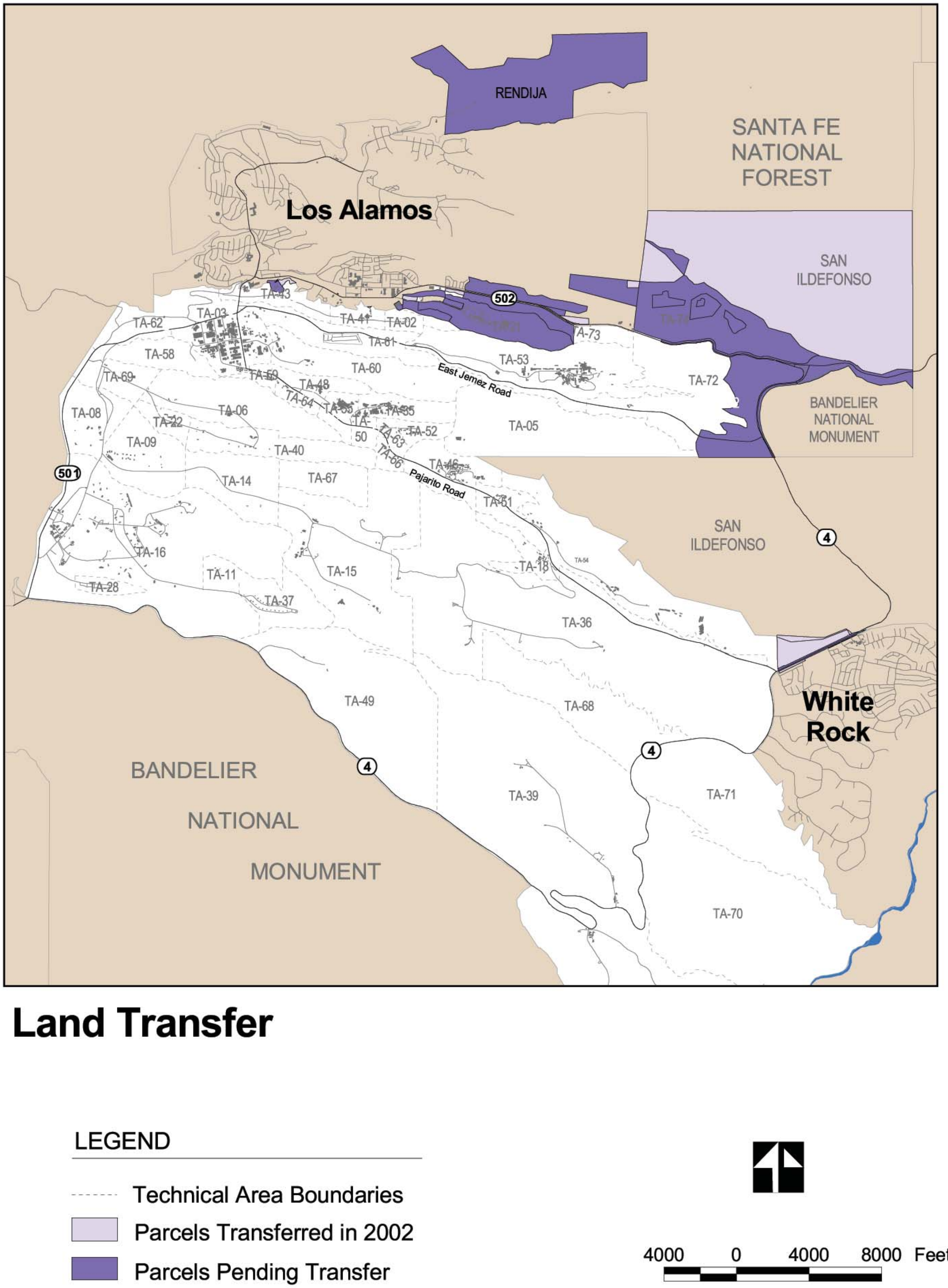


Figure 5-3. LANL parcels for conveyance and transfer.

- Manhattan Monument tract, a fraction of an acre in size; located adjacent to Ashley Pond and consists of a plaque covered by a small pavilion.
- TA-74 tract, 2,698 acres - located east of the Los Alamos townsite and includes much of Pueblo Canyon.

DOE's *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers* (DOE 1999b) provides guidance on the types of information needed to support real property transfers. Information such as the presence of floodplains and wetlands; critical habitats; historic properties; and hazardous substances must be gathered and provided to the potential recipients of the property.

An Environmental Baseline Survey is prepared in accordance with the *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers* in preparation of conveying or transferring ownership of a subparcel at LANL from the DOE/NNSA to either Los Alamos County or the Department of Interior pursuant to Public Law 105-119, Section 632. It discusses NNSA compliance with the environmental requirements associated with real property transfers. It also demonstrates that, although potentially contaminated, a subparcel is in such condition that NNSA may issue deeds on the basis that "all remedial action necessary to protect human health and the environment has been taken." The methodology used to prepare the Environmental Basline Surveys is to

- conduct an environmental site assessment of the subparcel consistent with the American Society of Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM 2000),
- review historical and current information and documents pertinent to the subparcel,
- perform a physical examination of the subparcel, and
- consult with both UC and NNSA staff to confirm existing information or develop additional information as necessary.

Table 5.2.3.2-1 identifies those subparcels transferred during CY 2002. This resulted in a boundary change of LANL and a loss of about 2,209 acres of land changing the size of LANL from about 43 square miles to about 40 square miles.

Table 5.2.3.2-1. Land Subparcels Transferred during CY 2002

DESIGNATOR	DESCRIPTION	RECIPIENT	TRANSFER DATE	ACREAGE
A-1	Manhattan Monument	Los Alamos County	October 31, 2002	0.07
A-12	Los Alamos Area Office-1 (East)	Los Alamos County	October 31, 2002	4.51
A-17	TA-74-1 (West)	Los Alamos County	October 31, 2002	5.52
A-19	White Rock-1	Los Alamos County	October 31, 2002	76.33
A-2	Site 22	Los Alamos County	October 31, 2002	0.17
A-3	Airport-1 (East)	Los Alamos County	October 31, 2002	9.44
A-6	Airport-4 (West)	Los Alamos County	October 31, 2002	4.18
A-9	DP Road-2 (North) (Tank Farm)	Los Alamos County	October 31, 2002	4.25
B-1	White Rock-2	Pueblo of San Ildefonso	October 31, 2002	14.94
B-2	TA-74-3 (North) (Includes B-4)	Pueblo of San Ildefonso	October 31, 2002	2,089.88
Total				2,209.29

5.2.4 Buildings

As of July 2001, the Laboratory had over eight million gross square feet of space and leased approximately 250,000 square feet within Los Alamos County. In early 2002, SCC was completed and made another 300,000 square feet of space available. When NISC is completed in 2003, there will be an additional 163,000 square feet of space.

There is currently a Congressional requirement to remove one square foot of old structure for each new square foot of construction. Over 500,000 square feet of space has either been identified as excess or been proposed to be excessed over the next 10 years. (See Appendix F.)

Aerial view of TA-3 before the Cerro Grande Fire

The primary construction projects funded through FY 2002 are identified in Table 5.2.4-1. The major proposed construction projects through FY 2012 are shown in Table 5.2.4-2. Each of these construction projects undergoes individual NEPA review and is closed out with a formal determination of being covered by a categorical exclusion, an environmental assessment with a finding of no significant impact, or an environmental impact statement with a record of decision from DOE. (The NEPA status for these projects is summarized in Appendix F.)

Table 5.2.4-1. Primary Construction Projects Funded through FY 2002

TA	PROJECT INITIATED	FUNDED	BENEFICIAL OCCUPANCY	FUNDING TYPE [a]	GSF [b]
15	DARHT Phase 2	FY 1999	FY 2002	LI	8,300
03	Metropolis Center (SCC)	FY 1999	FY 2002	LI	300,000
03	NISC	FY 2000	FY 2003	LI	163,400
03	Nonproliferation and International Security Division Office Building	FY 2000	FY 2003	LI	20,000
69	Emergency Operations Center	FY 2001	FY 2003	LI	38,000
16	Tritium Science and Engineering Office Building	FY 2001	FY 2003	GPP	24,100
16	Weapons Engineering Office Building	FY 2001	FY 2003	LI	22,000
46	Chemistry Division Office Building	FY 2001	FY 2003	LI	22,000
03	Health, Safety, and Radiation Protection Clinic	FY 2002	FY 2003	GPP	19,000
03	Materials Science and Technology Division Office Building	FY 2002	FY 2003	GPP	20,000
03	S-3 Facility	FY 2002	FY 2003	GPP	20,000
03	Decision Applications Division Office Building	FY 2002	FY 2003	GPP	18,000
03	BSL-3 Facility	FY 2002	FY 2003	GPP	3,300
03	Los Alamos Center for Integrated Nanotechnologies Gateway	FY 2002	FY 2005	LI	31,000
55	Manufacturing and Technical Support Facility	FY 2002	FY 2003	GPP	18,000
16	Weapons Plant Support Facility	FY 2002	FY 2003	GPP	23,000
22	High Power Detonator Facility	FY 2002	FY 2003	GPP	TBD

[a] The funding types are line item (LI) and general plant project (GPP).
[b] GSF = gross square feet.

Table 5.2.4-2. Selected Proposed Construction Projects through FY 2012

TA	PROJECT INITIATED	FUNDED	BENEFICIAL OCCUPANCY	FUNDING TYPE [a]	GSF [b]
55	CMR Replacement	FY 2003	FY 2012	LI	100,000
22	Hydrotest Facility	FY 2003	FY 2004	GPP	18,000
63	Facility Waste Operations Office Building	FY 2003	FY 2004	GPP	18,000
03	Fuel Cell Facility	FY 2003	FY 2005	LI	20,000
16	Stockpile Support Facility	FY 2003	FY 2004	GPP	18,000
16	Shock and Vibration Lab	FY 2003	FY 2004	GPP	3,700
16	High Explosives Pressing Consolidation	FY 2003	FY 2004	GPP	3,700
66	Homeland Security Building	FY 2003	FY 2004	GPP	18,000
03	National Security Sciences Building	FY 2004	FY 2006	LI	275,000
16	General Tritium Support Stockpile Life Extension Program Support Building	FY 2004	FY 2005	GPP	2,000
16	Fabrication Facility	FY 2004	FY 2005	GPP	30,000
16	Advanced Manufacturing Office	FY 2004	FY 2005	GPP	18,000
16	ESA Division Facility Management Office Building	FY 2004	FY 2005	GPP	18,000
03	Communications Shop Building	FY 2005	FY 2005	GPP	6,200
16	Calibration Lab	FY 2005	FY 2006	GPP	12,000
22	Electronics Data Systems Building	FY 2005	FY 2007	GPP	10,100
53	Advanced Hydrotest Facility	FY 2005	FY 2010	LI	TBD
22	Vessel Facility 1 of 4	FY 2006	FY 2007	GPP	4,200
60	Support Services Consolidation	FY 2007	FY 2008	LI	TBD
22	Vessel Facility 2 of 4	FY 2007	FY 2008	GPP	4,200
50	RLWTF Upgrades	FY 2007	FY 2009	LI	N/A
22	Vessel Facility 3 of 4	FY 2008	FY 2009	GPP	4,200
22	Medium Heavy Lab	FY 2008	FY 2009	GPP	5,000
22	Vessel Facility 4 of 4	FY 2009	FY 2010	GPP	4,200
22	Replace Machine Shop	FY 2009	FY 2010	GPP	10,000
22	Classified High Explosives Storage	FY 2011	FY 2011	GPP	2,000
TBD	Joint DX/ESA Conference Facility	FY 2011	FY 2011	GPP	5,000

[a] The funding types are line item (LI) and general plant project (GPP).
[b] GSF = gross square feet.

5.2.5 Workforce

The Laboratory's affiliated workforce includes employees of the prime contractor, the UC, and subcontractors. The major subcontractors in 2002 were JCNNM and PTLA. As at the time the SWEIS was published, the Laboratory employs both technical and nontechnical subcontractors, as well as consultants from around the world on a temporary basis.

5.2.6 Cerro Grande Fire

The Cerro Grande Fire damaged and destroyed important facilities, equipment, and infrastructure at the Laboratory and had a significant impact on mission-critical facilities. Emergency funding received by the Laboratory addressed the damage to Laboratory property from the fire and ongoing risk.

The Cerro Grande Rehabilitation Project has implemented a three-phased approach to recover from the fire.

- Phase 1: An emergency recovery or short-term phase addressed immediate dangers. These included constructing a flood retention structure in Pajarito Canyon, building weirs, hydro-seeding over 700 acres, and installing other erosion control measures. This phase was completed in the first quarter of FY 2001.
- Phase 2: Demonstrated vulnerabilities are being addressed by thinning forests to create fire-

A track mounted Harvester removing a ponderosa pine

Low-head weir near the White Rock Y

defensible space around all Laboratory buildings and structures. The work also includes repairing and replacing equipment, roofs, sewer lines, and gas and electrical lines. This phase was 70 percent complete at the end of FY 2002.

- Phase 3: This consists of fire-mitigation activities such as thinning approximately 10,000 acres of trees on Laboratory property, continuing erosion control, and the execution of five line-item construction projects. The line-item construction projects include the new Emergency Operations Center, two office buildings, a multichannel communications system, replacement of major portions of the Laboratory fire alarm system, and addressing demonstrated vulnerabilities at waste management facilities located at TA-50 and TA-54.

5.3 Mission Needs and Program Descriptions

5.3.1 Current Missions, Programs, and Workloads

The Laboratory's primary missions are

- to ensure the safety and reliability of the U.S. nuclear weapons stockpile;
- to develop technical means for reducing the global threat of weapons of mass destruction or terrorism (including biological, chemical, nuclear, and cyber); and
- to solve national problems in energy, environment, infrastructure, and health security, using the investment in people and facilities implied by the first two missions.

The Weapons Engineering and Manufacturing, Weapons Physics, Threat Reduction, and Strategic Research directorates are devoted to achieving the Laboratory's missions.

5.3.2 Readiness in Technical Base and Facilities

The RTBF mission (LANL 2002b, 2002c) is to ensure that the right facilities and infrastructure are in place to manufacture and certify the 21st century nuclear weapons stockpile and that the Laboratory is implementing the technologies and methods necessary to make construction, operation, and maintenance of NNSA/Defense Programs facilities safe, secure, and cost effective. The RTBF program provides the physical and operations infrastructure required to conduct the scientific, technical, and manufacturing activities of the stockpile stewardship program. The RTBF program will maintain facilities and technologies in an appropriate condition so that they are not limiting factors in the accomplishment of the NNSA/Defense Programs mission.

In order to attain the RTBF program goals, the Laboratory must

- make cost-effective investments in the infrastructure, workforce, facilities, and technologies to enable effective program management of activities;
- continue to deliver and maintain safe and secure facilities that provide the means to perform and deliver the requisite levels of science and technology associated with maintaining the safety and reliability of the nuclear weapons stockpile; and
- continue to provide the balance of the physical and intellectual infrastructure underpinnings necessary to support the goals and mission of NNSA/Defense Programs.

The majority of the RTBF direct funds support facility “warm standby” operations for the major NNSA/ Defense Programs experimental and manufacturing facilities. The “warm standby” condition is defined as the state of readiness for programmatic operations.

RTBF has been in place since FY 2000 and allows the Laboratory to embark on a set of improvements focusing on facilities and management techniques. The RTBF funds also support urgent maintenance, major upgrades, and other NNSA/Defense Programs facility maintenance not funded within the warm standby definition as well as

- material recycle and recovery that is targeted at reducing the SNM holdings at the Laboratory,
- surveillance and maintenance of excess facilities awaiting decommissioning and demolition, and
- waste management.

In FY 2002, LANSCE proposed a multiyear modernization initiative and DARHT clarified its plans to transition from construction to operations using RTBF funding.

5.3.3 Linkages Between Facilities and Infrastructure and Mission Needs

The Laboratory has developed a tabular summary relating program missions to facility alternatives and requirements. The summary also links the facility requirements to the programs and activities that are integral parts of the Laboratory’s current and future missions. The table is referred to as the Summary Missions/ Alternatives/Requirements Table and it attempts to capture the forecasted 10-year program mission campaign activities and link the activities to technologies and facilities required to accomplish the missions.

5.3.4 Future Missions, Programs, Workloads, and Impacts

Future missions, programs, workloads, and potential impacts are identified in the Summary Missions/ Alternatives/Requirements Table.

5.3.5 Technology Effects

The table also identifies future technologies and the facilities and infrastructure impacts and needs for these technologies and links these technologies with directed stockpile work, RTBF, and campaigns.

5.3.6 Special Needs of Current Missions, Programs, and Workloads

In order to meet the needs of current missions and programs, the Laboratory must maintain, upgrade, and conduct work in all facilities to ensure reliability and effectiveness. Table 5.3.6-1 highlights many of the Laboratory’s unique facilities and the particular mission needs they support.

Table 5.3.6-1. Specialized Facilities and Supported Mission Needs

SWEIS ROD REFERENCE	TYCSP REFERENCE	LOCATION	DOE SPONSOR	SUPPORTED MISSION NEEDS
2.1 Plutonium Complex (TA-55)	Plutonium Facilities	TA-55	NNSA/Office of Nuclear Weapons	Manufacturing of plutonium components Surveillance and disassembly of weapons components Actinide materials science and processing research and development Plutonium recovery from pit production and surveillance War reserve plutonium metal recovery and production Vault storage of nuclear materials Waste processing
2.2 Tritium Facilities (TA-16 and TA-21)	Tritium Facilities	TA-16-205 (WETF); TA-21-209 (TSFF)	NNSA/Office of Nuclear Weapons and Office of Science	High-pressure gas fills and processing Gas-boost system testing and development Tritium research and development
2.3 Chemistry and Metallurgy Research Building (TA-03)	CMR	TA-03-29	NNSA/Office of Nuclear Weapons	Analytical chemistry Microstructural analysis Support for detonation surveillance Shielded hot-cell facility for plutonium weapons evaluation Limited fabrication, including casting, forming, welding, and joining, heat treating, and metallography
2.4 Pajarito Site (TA-18)	Pajarito Site	TA-18 all	NNSA/Office of Nuclear Weapons	Design, construction, research, development, and applications of critical experiments
2.5 Sigma Complex (TA-03)	Sigma Complex	TA-03-66	General	Fabrication of metallic and ceramic items, including boost system components and joint test assemblies Mock pit fabrication Mechanical property evaluations Metallography, microscopy, and extensive materials characterization Casting, metallic deformation processing, powder metallurgy, welding and joining, and complete characterization of metals from Z number 4 (beryllium) to 92 (uranium) Capability exists to manufacture ceramic components from oxide, nitride, sulfide, and carbide materials
	Beryllium Technology Facility (BTF)	TA-03-141	NNSA/Office of Nuclear Weapons	Beryllium component fabrication for stockpile systems
2.6 Materials Science Laboratory (TA-03) [a]				
2.7 Target Fabrication Facility (TA-35) [a]				
2.8 Machine Shops (TA-03)	Engineering Machine Shops	TA-03-39; TA-03-102	NNSA/Office of Research, Development, and Simulation	Support pit and mock pit production Depleted uranium machining and inspection Beryllium product inspection

Table 5.3.6-1. Specialized Facilities and Supported Mission Needs (continued)

SWEIS ROD REFERENCE	TYCSP REFERENCE	LOCATION	DOE SPONSOR	SUPPORTED MISSION NEEDS
2.9 High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, TA-37)	Radiography Building	TA-08-22	NNSA/Office of Research, Development, and Simulation	Nondestructive testing of pit parts, pit assemblies, and other products
2.10 High Explosives Testing (TA-14, TA-15, TA-36, TA-39, TA-40)	DARHT	TA-15-312	NNSA/Office of Research, Development, and Simulation	Hydrodynamic testing
2.11 Los Alamos Neutron Science Center (TA-53)	LANSCE	TA-53	NNSA/Office of Research, Development, and Simulation	Proton radiography and neutron resonance spectroscopy Studies of materials properties of direct relevance to stewardship, including special nuclear materials and high explosives over a neutron energy range relevant to weapons systems Research on mission-critical requirements of the stockpile stewardship program by experimental validation of predictive tools and models
2.12 Health Research Laboratory (TA-43) [a, b]				
2.13 Radiochemistry Facility (TA-48) [a]				
2.14 Radioactive Liquid Waste Treatment Facility (TA-50)	Radioactive Liquid Waste Treatment Facility	TA-50-01	NNSA/Office of Research, Development, and Simulation	Final treatment of liquid radioactive and industrial waste
2.15 Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)	Solid Radioactive Waste Management Facility	TA-54	NNSA/Office of Research, Development, and Simulation	Management of solid radioactive waste
2.16 Non-Key Facilities	Nicholas C. Metropolis Center for Modeling and Simulation (formerly SCC)	TA-03	NNSA/Office of Research, Development, and Simulation	Numerical simulation models of nuclear weapons
	NISC (complete in FY 2003)	TA-03	Nonproliferation	Arms control Treaty verification Nuclear safeguards Nonproliferation Weapons assessment
2.17 Environmental Restoration Project [a]				

[a] Not included in this specialized facilities listing.

[b] Renamed Bioscience Facilities.

5.3.7 Facilities and Infrastructure Impacts from Non-NNSA Programs

At this time, there are no identified activities from non-NNSA programs that could impact the site's current and/or future NNSA facilities and infrastructure activities. The specialized non-NNSA facilities are identified in Table 5.3.7-1. These facilities include three new buildings.

Table 5.3.7-1. Specialized Non-NNSA Facilities [a]

SWEIS ROD REFERENCE	TYCSP REFERENCE	LOCATION	DOE SPONSOR	SUPPORTED MISSION NEEDS
2.12 Health Research Laboratory [b]	Health Research Laboratory (HRL)	TA-43	Varies	Biologically inspired materials and chemistry Computational biology Environmental biology Genomic studies Measurement science and diagnostics Molecular and cell biology Cytometry Structure biology
2.16 Non-Key Facilities	Center for Integrated Nanotechnologies (CINT) (complete in FY 2005)	TA-03	Office of Science	Nano/Bio/Micro interfaces Nanophotonics and nanoelectronics Nanomechanics Complex functional materials
	Fuel Cell Facility (complete in FY 2005)	TA-03	Office of Energy Efficiency and Renewable Energy	Low-Temperature Fuel Cell research and development: membrane/electrode/research and development, theory and modeling Enabling technologies: fuel processing, catalyst development, hydrogen storage and purification, sensors Advanced components: simplified systems, direct methanol systems, electrolyzers and reversible cells, alkaline fuel cells Industrial partnerships: portable electronics manufactures, automotive original equipment manufacturers fuel cell developers
	Emergency Operations Center (complete in FY 2003)	TA-69	Cerro Grande Rehabilitation Project	Emergency management Facility operations Emergency assessment Protection action formulation Joint dispatch operations

[a] All other Key Facilities identified in the SWEIS ROD (DOE 1999c) are not included in this specialized facilities listing.

[b] Renamed Bioscience Facilities.

During the early 1990s, several facilities were transferred from NNSA/Defense Programs to Environmental Management for surveillance and maintenance followed by decommissioning. In recent years, candidate facilities for transfer have been discussed, but none have been transferred from NNSA/Defense Programs to NNSA/Environmental Management.

5.4 The Plan

5.4.1 Planning Process

The FY 2003 TYCSP focuses on the physical assets that support the Laboratory's missions and operations. The plan was developed from the four levels of the Laboratory's strategic planning process: mission objectives, permit to operate, operational plans, and supporting plans. The planning process translates into the following:

- The mission objectives incorporate the institutional plan with the Laboratory's annual goals and objectives.
- The permit to operate includes the authorization basis (facility permit to operate) and the SWEIS (operating envelope).
- The operational plans include the *Site Safeguards and Security Plan*; *Environment, Safety, and Health Management Plan*; *Integrated Natural and Cultural Resources Management Plan for Los Alamos National Laboratory* (DOE 2002), program planning, and budget, and workforce planning.
- The supporting plans that include the Comprehensive Site Plan 2000/2001 (LANL 1999a, 2001), area development plans, facility strategic plans, and master plans.

The accumulation of data from these four levels forms the TYCSP.

5.4.2 Facilities

More than half of the Laboratory's facilities are currently over 30 years old, including nuclear and nonnuclear facilities. Over the next 10 years, facilities aged 30 or more years old will increase to seven million gross square feet. Without implementing the proposed demolition and replacement of aging facilities, the Laboratory's ability to carry out the stockpile stewardship mission is seriously threatened. Nineteen percent of the Laboratory's structures are planned for excess within the next 10 years because of their inadequacy to meet long-term missions.

The facilities have been evaluated relative to their role in serving the Laboratory's mission and what maintenance each requires. Some facilities have been identified as excess. These will be converted for other use, decontaminated and demolished, or preserved for their historical value.

Table 5.4.2-1 provides a summary relative to structures for FY 2002 and FY 2003.

5.4.3 Utilities

The ownership and distribution of utility services are split between DOE and Los Alamos County. Utility systems at the Laboratory include electrical services, natural gas, steam, water, sanitary wastewater, telecommunications and data networks, and refuse.

Electrical Power. There are approximately 140 miles of transmission and primary electrical distribution lines at the Laboratory. Although the Laboratory's electrical power system is in generally good operating condition, there are specific concerns that will require attention are summarized in Table 5.4.3-1.

Sanitary Waste Disposal System. Sanitary liquids are delivered by dedicated pipelines to the sanitary wastewater systems consolidation plant at TA-46. The plant has a capacity of 600,000 gallons per day. The sanitary sewer system has approximately 744,500 feet of pipeline. In general, the collection system is in satisfactory operating condition and the plant is in excellent condition and will adequately accommodate future demand. The specific concerns and related projects for this system are identified in Table 5.4.3-2.

Table 5.4.2-1. Summary of Proposed Future Condition by Gross Square Feet–FY 2002 and FY 2003

PLANNED/BUDGETED NEW (0 TO 3 YEARS)		FY	EXISTING WITH LONG-TERM MISSION	BUILDING TO BE EXCESSED 5 TO 10 YEARS	BUILDING TO BE EXCESSED 0 TO 5 YEARS	TEMPORARY/ UTILITARIAN STRUCTURES	SPARE	LEASED
Engineering Facilities	20,000	02	405,069	188,151	251,983	17,564	0	0
	43,000	03	400,455	188,122	168,545	17,596	0	0
Tritium Facilities	20,000	02	19,568	0	74,497	0	0	0
	0	03	42,629	0	69,145	0	0	0
LANSCE	5,062	02	842,825	7,149	1,158	50,940	5,166	0
	5,062	03	843,205	7,149	0	48,410	5,166	0
Dynamic Experiments	0	02	278,331	159,332	22,931	11,687	17,349	0
	5,600	03	277,548	158,564	21,151	8,432	4,338	0
Materials Science/Laser	0	02	508,659	11,245	164	25,711	0	0
	18,000	03	526,820	0	164	2,133	0	0
Waste Management	13,200	02	209,255	47,251	2,587	37,153	0	0
	13,200	03	201,905	47,251	2,227	40,795	0	0
Computer Facilities	300,000	02	468,257	9,006	6,159	30,107	0	0
	0	03	819,179	35,707	0	25,899	0	0
Nuclear (SNM)	7,500	02	397,205	667,727	840	18,340	0	0
	25,500	03	397,205	664,672	840	20,620	0	0
Nonproliferation and International Security/Decision Applications (Threat Reduction) [a]	165,000	02	215,841	83,658	53,865	29,606	40	0
Nonproliferation and International Security/Decision Applications/Bio-sciences (Threat Reduction) [b]	206,000	03	210,980	182,735	8,744	31,143	0	0
Strategic Research [a]	21,000	02	913,335	113,638	13,754	165,847	1,055	12,082
Institutional (Facility Waste Operations) [a]	35,600	02	475,723	386,844	405,208	96,547	0	310,485
Institutional Science Base Support Divisions [b]	92,600	03	1,309,970	344,620	537,109	205,052	0	345,539
Laboratory Total	587,362	02	4,734,068	1,674,001	833,146	483,502	23,610	322,567
	408,962	03	5,029,896	1,628,820	807,925	400,080	9,544	345,539
Excess Facilities	0	02	0	0	391,808	0	0	0
	0	03	0	0	652,050	0	0	0

[a] Not listed in FY 2003.
[b] Not listed in FY 2002.

Table 5.4.3-1. Electrical Power Concerns and Related Projects

CONCERNS	RELATED PROJECTS–CY 2002 AND BEYOND
Switchgear and circuit breakers in several locations are old and obsolete for the current system and need to be replaced.	Switchgear in several locations at the Laboratory is currently being replaced. The design, delivery, and installation of switchgear and equipment was completed for Sigma during CY 2002.
Step-down transformers, which supply all the electric power to the Laboratory's main technical area (TA-03) and the Los Alamos town site, are old and do not provide adequate redundancy. At TA-03, the 50-year-old transformers (30 megawatt capability each) serve a 50 megawatt-plus load. Because a single transformer cannot address the entire load, there is no redundancy.	The WTA 115 to 13.8 MVA (56 MVA capacity) transformer was put into service during 2002 and, when operational, will allow the replacement of the TA-03 transformers. Several other transformers are on the Institutional Projects List.
The two existing 115-kilovolt transmission lines that carry all the bulk electric power for the Laboratory and Los Alamos County terminate on a common bus and therefore lack true redundancy.	To address electrical power redundancy and availability, the project list includes projects to uncross the 115-kilovolt lines and to add a backpressure turbine at the power plant.
The program to monitor usage, power quality, and log events does not cover all applicable buildings and needs to be expanded.	The Laboratory's metering network program, which monitors usage, power quality, and log events from a central computer, has been expanded to include over 70 buildings. Fifty buildings will be added to the program each year.
TA-03 transformers are 50 years old and undersized. There is no redundancy to service the load.	The WTA 115 to 13.8 million volt amperes (56 million volt amperes capacity) transformer was put into service during 2002 and, when operational, will allow the replacement of the TA-03 transformers.
Portions of the 13.8-kilovolt aerial distribution lines are not adequate to carry the anticipated loads in 2011. Replacing existing conductors with heavier conductors and adding new circuits to support them are required to accommodate these future loads.	Replacement work has been done at DARHT, WETF, the SCC, and NISC and will continue with other projects.

Table 5.4.3-2. Sanitary Waste Disposal System Concerns and Related Projects

CONCERNS	RELATED PROJECTS–CY 2002 AND BEYOND
Individual pipe segments throughout the Laboratory have inadequate slopes and require a high degree of maintenance to remove built-up solids. A minimum flow velocity of two feet per second is required.	TA-03/58 gravity line.
	Replace broken sewer lines.
	The Cooling Tower Water Conservation project, planned for late FY 2003 completion, will use solid wastewater systems consolidation water instead of potable water for a set of cooling towers.

Radioactive Liquid Waste. There are three treatment facilities for handling the Laboratory's radioactive liquid waste at TA-21, TA-53, and TA-50, and a collection system that consists of 22,000 feet of piping. The piping in the collection system is in good condition. The specific concerns and related projects for this system are identified in Table 5.4.3-3.

Table 5.4.3-3. Radioactive Liquid Waste Concerns and Related Projects

CONCERNS	RELATED PROJECTS–CY 2002 AND BEYOND
TA-21 treatment facility is over 35 years old and in poor condition. Inactivity has contributed to the general deteriorating quality and a number of storage vessels do not meet current practices for environmental protection.	Decontamination and demolition of the TA-21 treatment facility.
TA-50 treatment facility is over 35 years old and in poor condition. The facility is undersized for handling its current load of waste generated by approximately 1,800 points at the Laboratory.	Repairs and upgrades to the ventilation system at the TA-50 facility are needed to continue operations for the next 10 years. Reliability improvements to the membrane system are needed to provide additional capacity. Upgrade the facility to enhance treatment efficiencies, relieve safety concerns, and address environmental concerns.
Separated treatment operations	Relocate/upgrade the high activity pretreatment operation to meet space and safety needs.
Inadequate storage capacity could be overwhelmed by a surge of radioactive liquid waste.	Add influent storage and instrumentation for continued operations.
Flow meters at generator facilities do not function well and it is difficult to sample the radioactive liquid waste for compliance with acceptance criteria.	Add influent storage and instrumentation for continued operations.

Central Steam System. The Laboratory has two primary sources of steam with the power plant in TA-03 and the TA-21 distributed steam plant, with capabilities of 360,000 pounds per hour and 36,000 pounds per hour, respectively. The power and generator plants have the capacity to deliver three times the current demand, and this will accommodate future development in the TA-03 area. The steam distribution is primarily underground in over 20 miles of steel piping, which is well maintained and in good condition. The specific concerns and related projects for this system are identified in Table 5.4.3-4.

Table 5.4.3-4. Central Steam System Concerns and Related Projects

CONCERNS	RELATED PROJECTS–CY 2002 AND BEYOND
Steam system condensate return lines are made of various materials, only some of which have cathodic protection, and deterioration is rapid in some instances.	TA-03 condensate lines.
A condensate return rate of 60% to 75% is being currently achieved and should be increased to improve central plant performance.	
There are sections of the steam system that have had a high leak rate and therefore high repair requirements that need replacement.	Power plant steam piping replacement, cooling tower piping replacement, feed water piping, and condensate return piping.
	Flue gas recirculation ductwork.

Water Supply System. The Laboratory has a target water consumption of 1,662 acre-feet per year. Water demand based on projected growth may require water beyond recent usage levels. In accordance with the LANL Site-Wide Water Conservation Plan (Beers 2001) key recommendation, an Interim Water Conservation Committee has been established and an Acting Water Conservation Officer appointed.

Potable water is obtained from deep wells located in three well fields. This water is pumped into production lines, and booster pump stations lift the water to reservoir storage tanks for distribution. The well fields can easily provide forecasted water demands for the next 10 years. The Laboratory water system is in generally good condition. The specific concerns and related projects for this system are identified in Table 5.4.3-5.

Table 5.4.3-5. Water Supply System Concerns and Related Projects

CONCERNS	RELATED PROJECTS – CY2002 AND BEYOND
Future water availability	The Laboratory has initiated a project to increase the TA-03 and TA-53 cooling towers' cycles of concentration from two to six and is investigating water saving opportunities: • Greater use of recycled water. • Use of Los Alamos County wastewater for current and future Laboratory needs. • Sustainable design of new facilities to include water-saving fixtures, reuse of gray water, low-water-use vegetation in landscaping, and use of natural space cooling versus water cooling. • Complete reuse/recycle for potential irrigation, cooling, retention, fire suppression, and recharge.
Water pressure in lower-elevation areas often exceeds the pressure rating for the distribution piping.	The water distribution system has been enhanced by the installation of equipment to control the pressure.
Some fire hydrants are connected to undersized lines that need to be replaced.	
	A preventive maintenance program is in place.
	Laboratory is working on a project to connect the system to the SCADA (monitoring and alarm) system.

Natural Gas. Approximately 90 percent of the gas used is for heating (both steam and hot air), and the remainder is used for electrical production. In general, the natural gas system is old, with approximately 80 percent having been installed in the 1950s and 1960s. An aggressive cathodic protection installation and maintenance system was deployed in 1998, which has improved the integrity and condition of the system. The specific concerns and related projects for this system are identified in Table 5.4.3-6.

Table 5.4.3-6. Natural Gas Concerns and Related Projects

CONCERNS	RELATED PROJECTS – CY2002 AND BEYOND
No redundant border metering station capable of supplying full capacity gas demand exists.	100 psi natural gas lines at TA-03 and TA-16
The gas pipe serving TA-55 is too small to carry peak load capacity.	Pajarito Road gas line
A portion of the East Jemez Road 6-inch line is restricted.	

Utility Planning. The Laboratory has a Mitigation Action Plan for its utility systems that addresses, in part, specific measures for electrical power. The Laboratory is planning a comprehensive utility planning study that will evaluate the ability of the existing systems and will recommend necessary changes to the systems to meet Laboratory projected utility loads for the next 10 years. Future utility loads are to be modeled from the projects listed in the TYCSP. Factors to be considered are the future utility system capabilities, potential threats to existing services such as the end-of-operating life issues, maintenance history, and alternative solutions to ensure adequate utility delivery systems.

5.4.4 Production Readiness/Plant Capacity

In addition to the research and development contributions to the Stockpile Stewardship Program, the Laboratory has also established a program for limited-manufacturing assignments within the production complex for continued replacement of limited-life components and for replacement of components destructively tested as part of the surveillance program. The goal of the Laboratory's manufacturing program is to meet present and future component manufacturing requirements for the stockpile and simultaneously meet all safety and security requirements. The Laboratory is generally prepared and capable of meeting its directive-schedule production and surveillance missions. However, the aging facilities are an issue relative to readiness for future directed stockpile work.

5.4.5 Environment, Safety, and Health/Regulatory Issues

The Laboratory's Environment, Safety, and Health management processes are designed to enhance Environment, Safety, and Health performance, preparation of tactical and strategic plans, achievement of Operational Excellence Goals, business efficiency, Appendix F and O of the UC/DOE Prime Contract performance expectations, and the Laboratory's commitment to the DOE policy of attaining "daily excellence in the protection of the worker, the public, and the environment."

Compliance Issues. There are four compliance activities that may have an impact on existing and new facilities:

- Quality Assurance: The final Code of Federal Regulation Rule for nuclear facility safety management (10 CFR 830) established new requirements for the Laboratory's nuclear facilities.
- Beryllium Rule Implementation: The Laboratory developed and received approval for a Chronic Beryllium Disease Prevention Program.
- Appendix O Safety Analyses: Appendix F and Appendix O of the UC/DOE Prime Contract provide specific expectations for the development and implementation of Safety Authorization Basis documentation for both nuclear and nonnuclear facilities.
- Hydrogeologic Workplan (Barr 2001): The plan describes activities to characterize the hydrogeologic setting beneath the site and to enhance the groundwater monitoring program. The plan is driven by regulatory requirements of the NMED, DOE Orders, and the Laboratory's commitment to groundwater protection.

Commitments. The Laboratory has made commitments to non-NNSA regulators:

- Elimination of Ozone Depleting Equipment: The Laboratory is required to eliminate pre-1984 chillers larger than 150 tons that use Class 1 ozone depleting substances. Only two major replacement projects remain–TA-48 (Building RC-1) and LANSCE.
- Defense Nuclear Facilities Safety Board Recommendation 2000-2 (DNFSB 2000): The recommendation calls for improvement in configuration management of vital safety systems. The Laboratory has major initiatives to revitalize institutional support services, standardize and integrate facility management programs, and optimize facility management units.

Improvements. There are two activities that have an impact on site operations:

- Environmental Restoration: A Performance Management Plan for Accelerating Cleanup (LANL 2000a) was forwarded to DOE Headquarters in July 2002. The plan calls for completing work by 2015 and describes three primary initiatives–legacy TRU and MLLW, groundwater protection, and environmental restoration.

- Fire Hazard Mitigation: Facility Fire Hazard Assessments are being completed for all nuclear facilities, high and moderate hazard nonnuclear facilities, new facilities as they are constructed and turned over for operations, and existing facilities with unique fire hazards or risks.
- NMED Corrective Action Order: On May 2, 2002, the NMED issued a Determination to LANL alleging that radioactive, hazardous, and solid wastes have been released and "may present imminent and substantial endangerment to human health or the environment." NMED publicly stated that it issued the ISE and Draft Order to obtain additional funding from DOE for cleanup at the Laboratory. DOE and UC have requested that NMED withdraw the ISE Determination and take no further action on the Draft Order. The Laboratory is already implementing, under NMED, a comprehensive, multimedia environmental restoration program that includes addressing, on a voluntary basis, materials beyond NMED's authority.

5.4.6 Security

A Security Strategy Working Group was chartered to identify security issues, prioritize preferred solutions, and provide a multiyear project plan. In response to September 11, 2001, security posts have been added, access restrictions have been implemented, and a permanent screening station for all commercial deliveries has been added.

5.4.7 Workforce Profile

Over the next five years, the Laboratory will experience a significant increase (approximately 13 percent) in the number of personnel. Primarily increasing mission and program requirements drive the impact. Table 5.4.7-1 provides workforce data by directorate for January 2002 and projections through FY 2006. The data

Table 5.4.7-1. Current and Projected Workforce Levels by Directorate

DIRECTORATE	CURRENT (JAN 2002)	PROJECTIONS				
		FY 2002 [a]	FY 2003 [b]	FY 2004 [b]	FY 2005 [c]	FY 2006 [c]
Institutional Science Base and Support Divisions						
Workforce	3,132	3,250	3,318	3,388	3,439	3,473
Critical Skills	49	65	69	70	72	73
Strategic Research						
Workforce	1,976	2,048	2,091	2,135	2,167	2,189
Critical Skills	220	271	303	304	310	312
Threat Reduction						
Workforce	1,367	1,453	1,484	1,515	1,537	1,553
Critical Skills	64	87	89	90	92	92
Weapons Engineering and Manufacturing						
Workforce	1,716	1,901	1,941	1,982	2,011	2,032
Critical Skills	446	534	596	618	628	636
Weapons Physics						
Workforce	2,231	2,371	2,421	2,472	2,509	2,534
Critical Skills	423	475	495	511	513	514
Total						
Workforce	10,422 [d]	11,023	11,254	11,491	11,663	11,780
Critical Skills	1,202	1,432	1,552	1,593	1,615	1,627
Net Increase						
Workforce		601	231	236	172	117
Critical Skills		230	120	41	22	12

[a] FY 2002 projections are approved hires.
[b] Projections represent standard escalations (2.1%).
[c] Projections assume reduced growth rate (FY 2005–1.5%; FY 2006–1.0%).
[d] Excludes JCNNM, PTLA, affiliates, and guests.

in the table are not readily comparable to the numbers of employees that have been routinely compiled for the Yearbooks (LANL 1999b, 2000b, 2000c, 2001b, 2002d). The data in Table 5.4.7-1 exclude PTLA and JCNNM and the critical skills are both a subset of the total workforce and are mission essential for stockpile stewardship. PTLA, in response to increased security requirements, is expected to increase by 200. The support services contractor will likely remain constant. These projected increases call for facilities to support a total workforce of approximately 14,000 people.

5.4.8 Transportation and Parking

Development of roads and parking has been incremental and neglected pedestrian, bicycle, and transit improvements. Maintenance of the transportation infrastructure has generally been inadequate to keep up with the needs. The new construction at TA-03 and the population increases at TA-55 have caused parking shortages. Additional parking lots have been added and are planned for both technical areas. The Laboratory is working on the development of a transportation infrastructure that provides for security, emergency, and safety needs.

5.4.9 Current Planning Initiatives

The current planning initiatives are directed at consolidation plans to ensure that the Laboratory can meet the RTBF mission. These efforts include addressing

- integrated nuclear planning,
- nuclear facilities consolidation,
- nuclear materials storage,
- Advanced Hydrotest Facility, and
- a sanitary landfill.

The Los Alamos County landfill that serves both the townsite and the Laboratory is nearing capacity. DOE, the Laboratory, and Los Alamos County are examining potential sites for a new sanitary landfill for the county. Laboratory sites are under consideration for the new landfill and discussions have included what can be done with the current landfill after closure.

5.4.10 Facility Strategic Planning

Extensive facility strategic planning efforts for consolidation are ongoing in alignment with and support of the TYCSP. Along with these efforts, coordinating activities include NEPA, space management, security planning, project launch and development, and maintenance prioritization. Projects defined through facility strategic planning are based on organizational vision and needs. The projects are prioritized by the directorate and institution through the TYCSP project call process. The projects approved for institutional prioritization are presented in the TYCSP project lists.

5.5 Facilities and Infrastructure Projects

5.5.1 Overview of Site Project Prioritization and Cost Profile

The TYCSP includes projects from the six funding sources described in Table 5.5.1-1.

5.5.2 Line Item Highlighted Projects

The highlighted projects are DARHT, the CMR Replacement Project, and the National Nuclear Security Building. Both DARHT and the CMR Replacement projects are discussed in Chapter 2, Sections 2.10 and 2.1 respectively. The National Security Science Building is a replacement for the Laboratory's 45-year-old SM-43 Building at TA-03. The project will provide office and research space to house theoretical and applied

Table 5.5.1-1. Funding Sources

FUNDING SOURCE	INCLUDES
Defense Program Line Items	Consistent with the Integrated Construction Program Plan direction from NNSA on August 7, 2002
RTBF (no line items)	Projects for RTBF facilities achieving warm standby benefits but excluding any project needed to increase program capability or capacity
FIRP	Projects that improve long-term physical conditions and mission availability as well as address the landlord infrastructure responsibilities of NNSA's nuclear weapons complex
Campaign/Directed Stockpile Work funded (no line items)	Projects supporting Defense Programs facilities not funded by RTBF and as needed to increase program capacity and capabilities in any DP facilities
Non-NNSA/Defense Programs	Non-NNSA/Defense Programs projects supported by specific programs
Institutional General Plant Projects	Institutionally funded for institutional benefits

Artist's rendering of the proposed National Security Sciences Building at TA-03

physics, computational sciences, and the Laboratory's program and senior management functions in support of the DOE's Stockpile Stewardship Program. The new building is currently planned to be located near the new SCC and NISC facilities, to have approximately 275,000 square feet of office space, and to house a staff of approximately 700. Construction of a parking structure and decommissioning and demolition of the SM-43 Building would also occur.

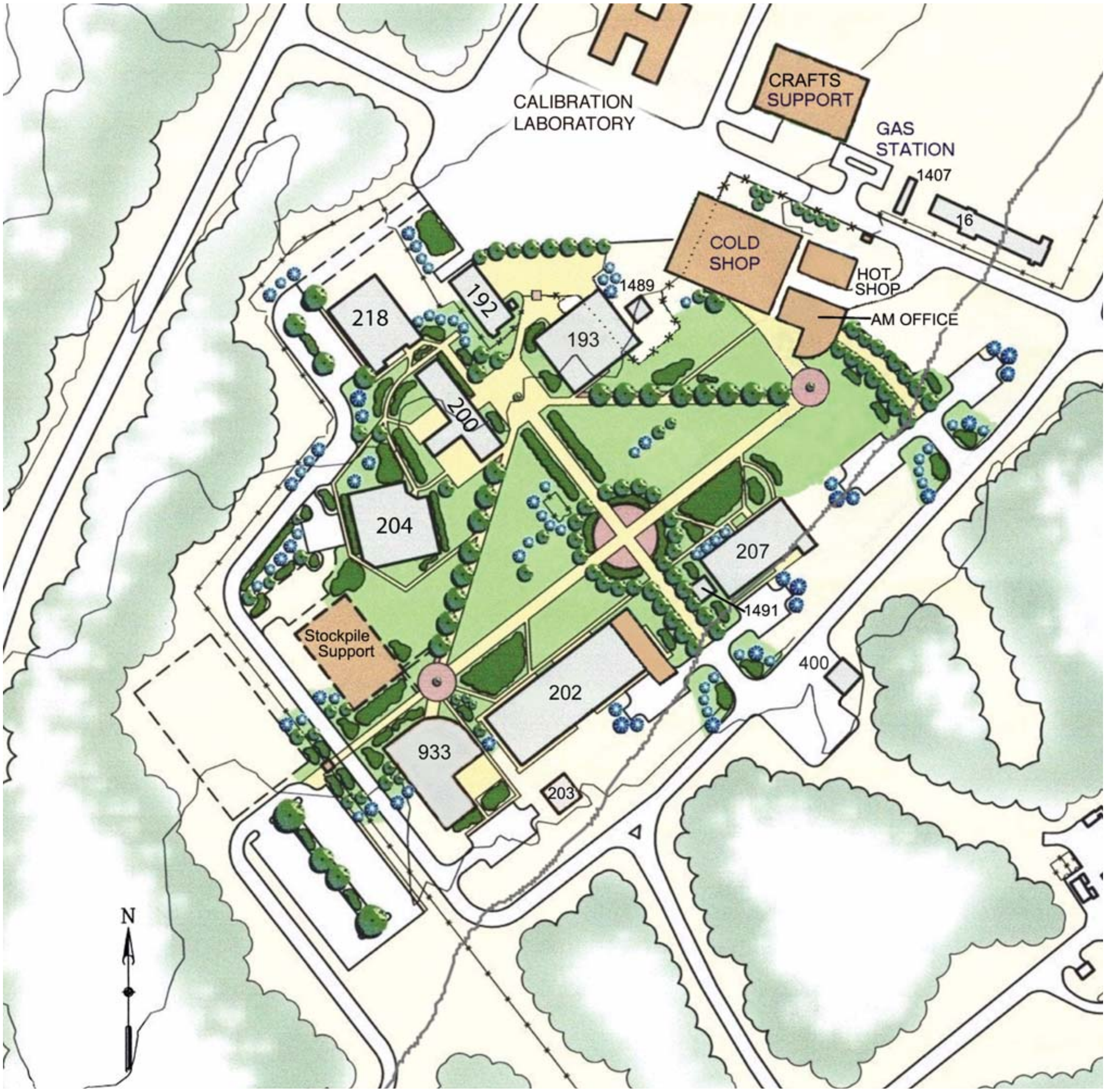
5.5.3 FIRP Highlighted Projects

The highlighted FIRP projects are the Security Systems Support Facility, the Decision Applications Division Office Building, the MST Office Building, and the Health Clinic. All of these projects are discussed in Chapter 2, Section 2.16.

5.5.4 RTBF/Operations of Facilities Highlighted Projects

The highlighted projects are from ESA Division consolidation. They include

- the upgrade of TA-16 West Jemez Road–to improve traffic flow into and out of TA-16, design completed in FY 2002, construction will be completed in FY 2003;



Conceptual design of the proposed Technical Area 16 engineering complex

- Weapons Plant Support Facility–to provide office and shop space for facility crafts and a change room for high explosives workers, fully funded in FY 2002, contract awarded in September 2002, completion expected in FY 2004;
- security upgrades and fencing–infrastructure improvements; and
- roads and utilities–improvements for utility upgrades and road relocations.

5.5.5 Non-RTBF/FIRP Highlighted Projects

The highlighted projects are the NISC, the Emergency Operation Center, the Cerro Grande Fire Office replacements, the Manufacturing Technical Support Facility, and the Center for Integrated Nanotechnologies. Only the Center for Integrated Nanotechnologies is not discussed in Chapter 2.

Emergency Operations Center (above center), Manufacturing Technical Support Facility (above left), Conceptual Design of the Center for Integrated Nanotechnologies (above right)

The Center for Integrated Nanotechnologies will be a distributed center to be operated jointly by Sandia National Laboratories and Los Alamos. The Los Alamos element of the project will provide a 31,000-square-foot gateway to connect scientists to the extensive biosciences and nanomaterials capabilities of LANL.

5.5.6 Institutional General Plant Projects

Institutional General Plant Projects is a newly approved funding source for new construction projects at multiprogram NNSA sites. Projects of a general institutional nature that are required for general purpose site-wide needs are considered appropriate candidates. Examples of projects that could be proposed in future years include the following:

- multiprogrammatic/interdisciplinary scientific laboratory,
- institutional training facility,
- new roads/parking,
- multiprogrammatic office space, and
- multiprogrammatic facilities required for “Quality of Life” improvements.

The Laboratory has proposed two projects for consideration.

5.5.7 Facilities and Infrastructure Cost Projection Spreadsheets

The Laboratory accomplishes critical infrastructure development, renovations, and upgrades through line item, general plant, capital equipment, and expense-funded projects. The primary categories of projects and costs are

- existing and proposed line item construction,
- other project costs for existing and proposed line item construction,
- preliminary engineering and design for proposed line item construction,
- capital equipment,
- expense,
- General Plant Project,
- institutional,
- maintenance,
- standby,
- decommissioning and demolition, and
- facility management and site planning costs.

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6.0 Summary and Conclusion

The 2002 Yearbook is a special edition to assist DOE/NNSA in evaluating the need for preparing a new SWEIS for LANL. Instead of limiting this edition of the Yearbook to CY 2002 data, the 2002 Yearbook summarizes the data routinely collected from CY 1998 through CY 2002:

- facility and/or process modifications or additions,
- types and levels of operations during the calendar year,
- operations data for the Key Facilities, and
- site-wide effects of operations for the calendar year.

This Yearbook also contains additional text and tabular summaries as well as a trend analysis and indicates the Laboratory's programmatic progress in moving towards the SWEIS projections.

6.1 Summary

The 2002 SWEIS Yearbook reviews CY 1998 through CY 2002 operations for the 15 Key Facilities (as defined by the SWEIS) at LANL and compares those operations to levels projected by the ROD. The Yearbook also reviews the environmental parameters associated with operations at the same 15 Key Facilities and compares these data with ROD projections. In addition, the Yearbook presents a number of site-wide effects of those operations and environmental parameters. The more significant results presented in the Yearbook are as follows:

Facility Construction and Modifications. The ROD projected a total of 38 facility construction and modification projects for LANL facilities. Ten of these projects were listed only in the Expanded Operations Alternative, such as modifications at CMR for safety testing of pits in the Wing 9 hot cells, expansion of the LLW disposal area at TA-54, Area G, and the LPSS at TA-53. These ten projects could not proceed until DOE issued the ROD in September 1999. However, the remaining 28 construction projects were projected in the No Action Alternative. These included facility upgrades (e.g., safety upgrades at the CMR Building and process upgrades at the RLWTF), facility renovation (e.g., conversion of the former Rolling Mill, Building 03-141, to the Beryllium Technology Facility), and the erection of new storage domes at TA-54 for TRU wastes. Since these projects had independent NEPA documentation, they could proceed while the SWEIS was still in process.

Of the 38 facility construction and modification projects for LANL projected in the ROD, 20 projects have now been completed: Six of these projects were completed in 1998, eight in 1999, two in 2000, none in 2001, and four in 2002. The number of projects started or continued each year were 13 in 1998, 10 in 1999, seven in 2000, and six in both 2001 and 2002.

During 2002, planned construction and/or modifications continued at six of the 15 Key Facilities. These activities were both modifications within existing structures and new or replacement facilities. New structures completed and occupied during 2002 included the TA-18 Relocation Project Office Building between TA-48 and TA-55, the Vessel Preparation Facility at TA-15, a Camera Room at TA-36-12, a Carpenter Shop at TA-15, the X-Ray Calibration Facility at TA-15, a warehouse at TA-15, and the transportable office building TA-48-210. Additionally, 13 major construction projects were either completed or continued for the Non-Key Facilities. These projects were as follows:

- Construction continued on the NISC begun in March 2001.
- Atlas was disassembled and relocated to the Nevada Test Site in December 2002.
- Construction of the Emergency Operations Center started in January 2002.
- Construction of the S-3 Facility started in July 2002.

- Construction of the Decision Applications Division Office Building started in September 2002.
- Construction of the new Medical Facility started in October 2002.
- The Chemistry Division Office Building was constructed, completed, and occupied.
- Construction of the MST Office Building started in November 2002.
- Construction of the TA-72 Live-Fire Shoot House started in November 2002.
- The Security Truck Inspection Station was constructed and became operational.
- The High Pressure Tritium Facility (TA-33-86) underwent decontamination and decommissioning and is now demolished.
- Demolition activities began in July 2002 on the Omega West Facility.
- TA-41-30 and the front of TA-41-4 were demolished August to October 2002.

The suspended catwalk observation platform in the Live Fire Shoot House

A major modification project, elimination and/or rerouting of NPDES outfalls, was completed in 1999, bringing the total number of permitted outfalls down from the 55 identified by the SWEIS ROD to 20. During 2000, Outfall 03A-199, which will serve the TA-03-1837 cooling towers, was included in the new NPDES permit issued by the EPA on December 29, 2000. This brought the total number of permitted outfalls up to 21.

Demolition of the Omega West Facility

Facility Operations. The SWEIS grouped LANL into 15 Key Facilities, identified the operations at each, and then projected the level of activity for each operation. These operations were grouped in the SWEIS under 96 different capabilities for the Key Facilities. With a few exceptions, the capabilities identified in the SWEIS ROD for LANL have remained constant since 1998. The exceptions are the

- movement of the Nonproliferation Training/Nuclear Measurement School between Pajarito Site and the CMR Building during 2000 and 2002,
- relocation of the Decontamination Operations Capability from the RLWTF to the Solid Radioactive and Chemical Waste Facilities in 2001,
- transfer of part of the Characterization of Materials Capability from Sigma to the TFF in 2001, and
- loss of Cryogenic Separation Capability at the Tritium Key Facilities in 2001.

Also, following the events of September 11, 2001, the Laboratory was requested to provide support for homeland security.

Since 1998, fewer than the 96 capabilities identified for LANL have been active. During 1998, only 87 capabilities were active. The nine capabilities with no activity were Manufacturing Plutonium Components at the Plutonium Complex; both Uranium Processing and Nonproliferation Training at the CMR Building; Accelerator Transmutation of Wastes at LANSCE; Biologically Inspired Materials and Chemistry, Computational Biology, and Molecular and Cell Biology at the Bioscience Facilities; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

During CY 1999, 91 capabilities were active. The five inactive capabilities were Fabrication and Metallography at CMR; both Accelerator Transmutation of Wastes and Medical Isotope Production at LANSCE; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

During CY 2000, 89 capabilities were active. The seven inactive capabilities were Fabrication of Ceramic-Based Reactor Fuels at the Plutonium Complex; Diffusion and Membrane Purification at the Tritium Facilities; both Destructive and Nondestructive Assay and Fabrication and Metallography at CMR; Accelerator Transmutation of Wastes and Medical Isotope Production at LANSCE; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

During CY 2001, 87 capabilities were active. The nine inactive capabilities were both Manufacturing Plutonium Components and Fabrication of Ceramic-Based Reactor Fuels at the Plutonium Complex; both Cryogenic Separation and Diffusion and Membrane Purification at the Tritium Facilities; both Destructive and Nondestructive Assay and Fabrication and Metallography at CMR; Accelerator Transmutation of Wastes and Medical Isotope Production at LANSCE; and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

During CY 2002, 88 capabilities were active. The eight inactive capabilities were: Manufacturing Plutonium Components at the Plutonium Complex; both the Cryogenic Separation and the Diffusion and Membrane Purification capabilities at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; both the Accelerator Transmutation of Wastes and the Medical Isotope Production capabilities at LANSCE; and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

While there was activity under nearly all capabilities, the levels of these activities were mostly below levels projected by the ROD. For example, the LANSCE linac generated an H^- beam to the Lujan Center for 2,303 hours in 2002, at an average current of 105 microamps, compared to 6,400 hours at 200 microamps projected by the ROD. Similarly, a total of 160 criticality experiments were conducted at Pajarito Site, compared to the 1,050 projected experiments.

As in 1998 through 2001, only three of LANL's facilities operated during 2001 at levels approximating those projected by the ROD—the MSL, the Bioscience Facilities (formerly HRL), and the Non-Key Facilities. The two Key Facilities (MSL and Bioscience) are more akin to the Non-Key Facilities and represent the dynamic nature of research and development at LANL. More importantly, none of these facilities are major contributors to the parameters that lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below projected activity levels.

Operations Data and Environmental Parameters. This 2002 Yearbook evaluates the effects of LANL operations in three general areas—effluents to the environment, workforce and regional consequences, and changes to environmental areas for which the DOE has stewardship responsibility as the owner of a large tract of land.

Effluents include air emissions, liquid effluents regulated through the NPDES program, and solid wastes. From 1998 through 2002, radioactive airborne emissions from point sources (i.e., stacks) have varied from a low of 1,900 curies during 1999 to a high of approximately 15,400 curies during 2001, 70 percent of the 10-year average of 21,700 curies projected by the SWEIS ROD. The final dose over this same five-year period has varied from a low of 0.32 millirem in 1999 to a high of 1.84 millirem during 2001 (compared to 5.44 projected), with the final dose of 1.69 millirem for 2002 being reported to the EPA by June 30, 2002. Calculated NPDES discharges have ranged from a low of 124 million gallons per year in 2001 to a high of 317 million gallons per year in 1999 compared to a projected volume of 278 million gallons per year. However, the apparent decrease in flows is primarily due to the methodology by which flow was measured and reported in the past.

Historically, instantaneous flow was measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day/seven-day week. With implementation of the new NPDES permit on February 1, 2001, data are collected and reported using actual flows recorded by flow meters at most outfalls. At those outfalls that do not have meters, the flow is calculated as before, based on instantaneous flow. Quantities of solid radioactive and chemical wastes generated have ranged from approximately 3.2 percent of the MLLW projections during both 1999 and 2002 to 1,291 percent and 1,309 percent of the chemical waste projections during 2001 and 2000, respectively. The extremely large quantities of chemical waste (23.0 million kilograms during 2001 and 27.2 million kilograms during 2000) are a result of ER Project activities. (For example, the remediation of MDA-P resulted in 21.5 million kilograms, or 88 percent, of the 24.4 million kilograms of chemical waste generated during 2001.) Most chemical wastes are shipped offsite for disposal at commercial facilities; therefore, these large quantities of chemical waste will not impact LANL environs. The chemical waste quantities are the only solid waste type to have met or exceeded the SWEIS ROD projections between 1998 and 2002.

The workforce has been above ROD projections since 1997. The 13,524 employees at the end of CY 2002 represent 2,173 more employees than projected and the highest number of employees over the period. Thus, regional socioeconomic consequences, such as salaries and procurements, also should have exceeded projections.

Since 1998, the peak electricity consumption was 394 gigawatt-hours during 2002 and the peak demand was 72 megawatts during 2001 compared to projections of 782 gigawatt-hours with a peak demand of 113 megawatts. The peak water usage was 461 million gallons during 1998 (compared to 759 million gallons projected), and the peak natural gas consumption was 1.49 million decatherms during 2001 (compared to 1.84 projected).

Between 1998 and 2002, the highest collective TEDE for the LANL workforce was 196 person-rem during 2000, which is considerably lower than the workforce dose of 704 person-rem projected by the ROD.


Anthropomorphic petroglyph

Measured parameters for ecological resources and groundwater were similar to ROD projections, and measured parameters for cultural resources and land resources were below ROD projections. For land use, the ROD projected the disturbance of 41 acres of new land at TA-54 because of the need for additional disposal cells for LLW. As of 2002, this expansion had not become necessary. However, construction continued on 44 acres of land that are being developed along West Jemez Road for the Los Alamos Research Park. This project has its own NEPA documentation (an environmental assessment), and the land is being leased to Los Alamos County for this privately owned development.

Cultural resources remained protected, and no excavation of sites at TA-54 or any other part of LANL has occurred. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.) However, there have been excavations related to the land transfer project under the auspices of a programmatic agreement between the DOE, the State Historic Preservation Office, and the Advisory Council on Historic Preservation. These excavations are required before releasing these lands to Los Alamos County under Public Law 105-119.


Day flower

As projected by the ROD, water levels in wells penetrating into the regional aquifer continue to decline in response to pumping, typically by several feet each year. In areas where pumping has been reduced, water levels show some recovery. No unexplained changes in patterns have occurred in the 1995–2002 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977.

In addition, ecological resources are being sustained as a result of protection afforded by DOE ownership of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity. The recovery and response to the Cerro Grande Fire of May 2000 has included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

6.2 Conclusions

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees or chemical waste from cleanup, either produced a positive impact on the economy of northern New Mexico or resulted in no local impact because these wastes were shipped offsite for disposal. Overall, the 1998 through 2002 operations data indicate that the Laboratory was operating within the SWEIS envelope.

The 1998 through 2002 data indicate that LANL operations typically remained below levels projected by the SWEIS ROD. There are two main reasons for this fact. The ROD was not issued until September 1999; consequently, operations were more likely to be at levels consistent with pre-ROD conditions. Moreover, data in the SWEIS were presented for the highest level projected over the 10-year period 1996–2005. Thus, the data from early years in the projection period (1996–2002) would be expected to fall below the maximum.

One purpose of the 2002 Yearbook is to compare LANL operations and resultant 1998 through 2002 data to the SWEIS ROD to determine if LANL was still operating within the environmental envelope established by the SWEIS and the ROD. Data for 1998 through 2002 indicate that positive impacts (such as socioeconomics) were greater than SWEIS ROD projections, while negative impacts, such as radioactive air emissions and land disturbance, were within the SWEIS envelope.

6.3 To the Future

The Yearbook will continue to be prepared on an annual basis, with operations and relevant parameters in a given year compared to SWEIS projections for activity levels chosen by the ROD. The presentation proposed for the 2003 Yearbook will follow that developed for the previous Yearbooks—comparison to the SWEIS ROD. As requested by DOE/NNSA, the Laboratory will include the results of an updated wildfire analysis in the 2003 Yearbook.

The 2002 Yearbook is an important step forward in fulfilling a commitment to make the SWEIS for LANL a living document. Future Yearbooks are planned to continue that role.

Wetland in Pajarito Canyon

Pajarito Canyon